SCIENTIFIC AMERICAN

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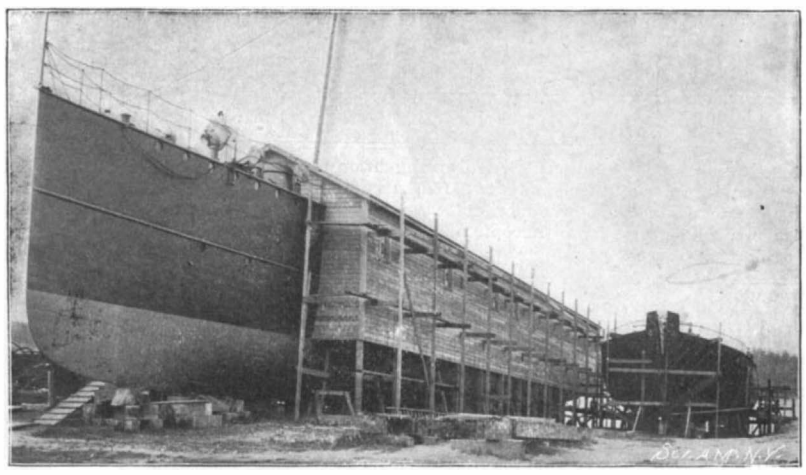
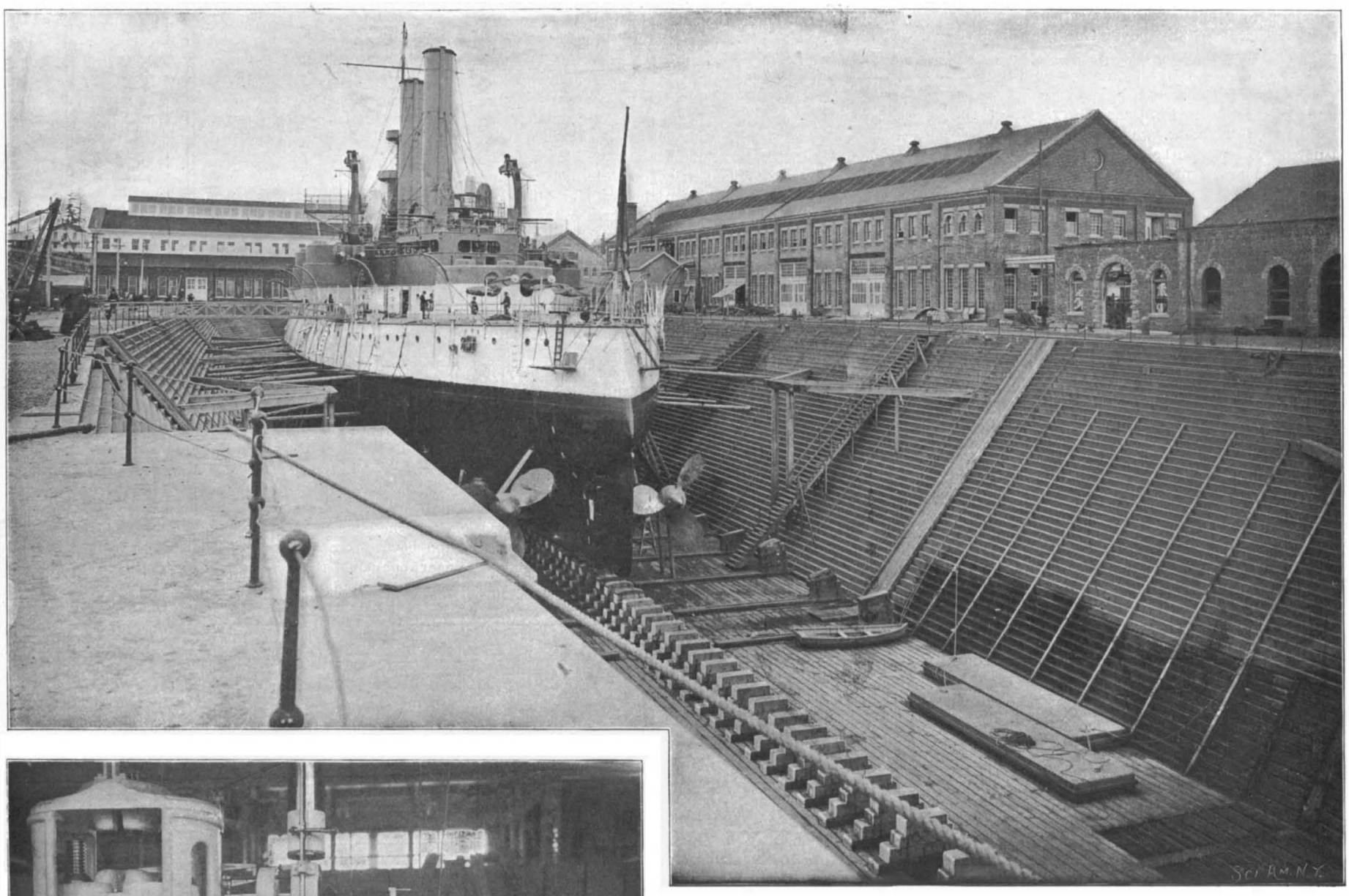
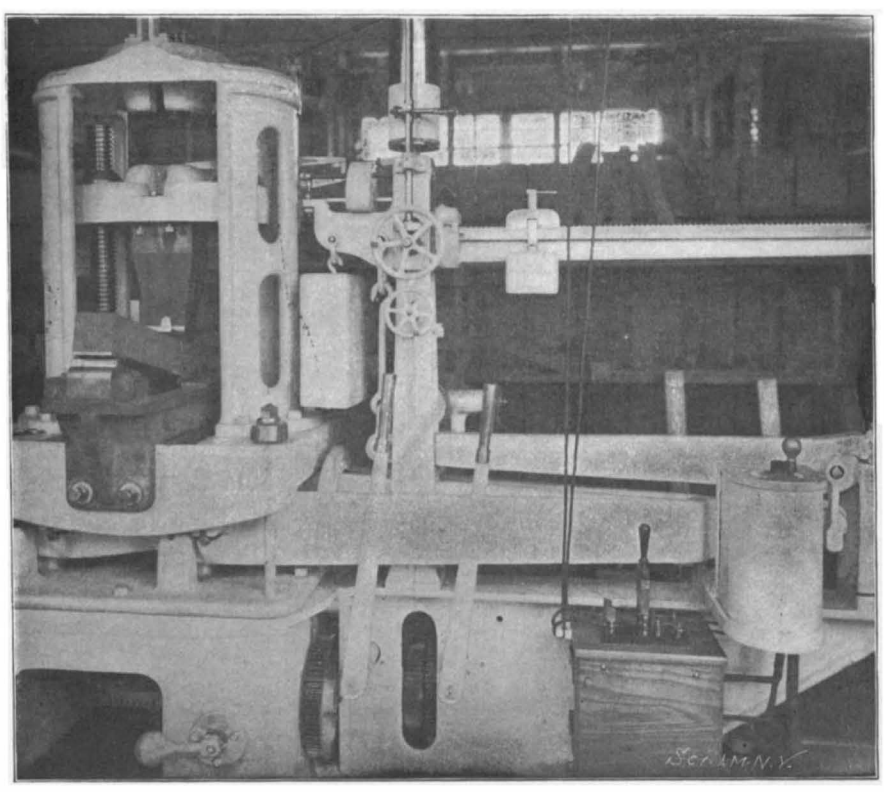
The Officers' Quarters.



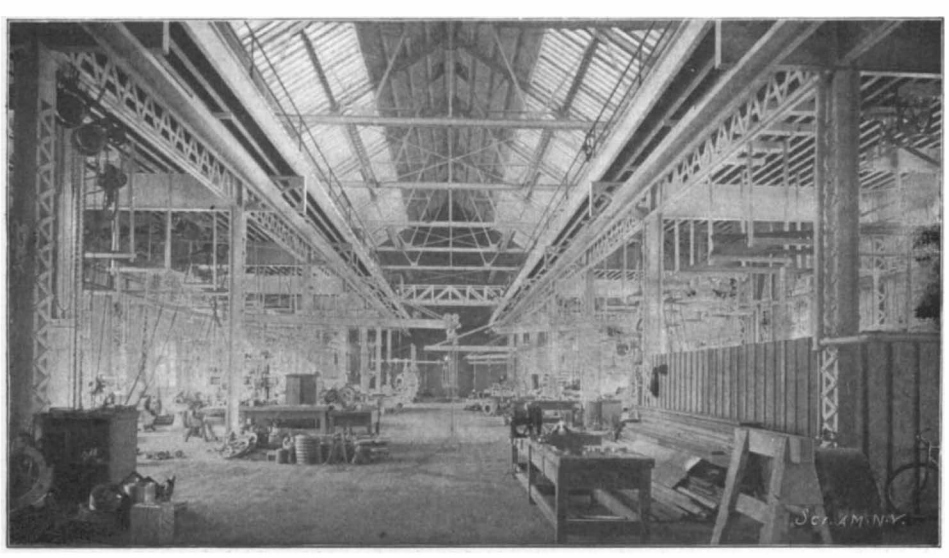
Torpedo Boat "Rowan" on the Stocks.



"Iowa" in the Drydock. Length of Dock, 650 Feet; Width, 67 Feet; Depth, 39 Feet.



Testing Transverse Strength of Timber.



The Machine Shop.

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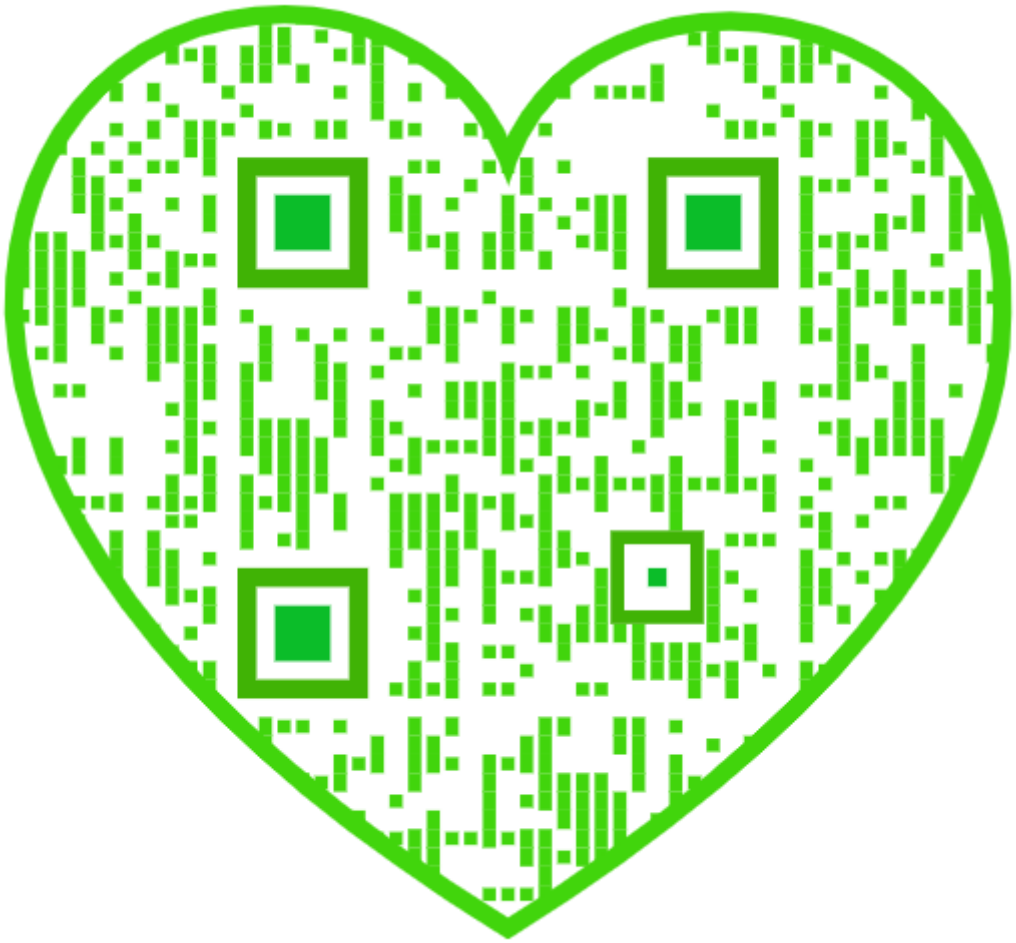
PUGET SOUND NAVY YARD AT BREMERTON.—[See page 328.]



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NEW YORK, SATURDAY, NOVEMBER 23, 1901.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

OUR NEW NAVY.

It is likely that but few, even among those of our readers who take a special interest in naval matters, realize what a large addition has been made to the United States Navy since the conclusion of the Spanish war. The great popularity of the Special Naval edition which this journal brought out during the war, coupled with frequently-recurring requests from our subscribers for a similar work bringing the development of our Navy up to date, has satisfied us that a special number describing our naval growth during the past three years would meet with public favor, and would answer a large number of inquiries, written and unwritten, regarding the exact present strength of the United States Navy. In preparing this Special Number, we have thought that we could not do better than be guided by the great popularity achieved by its predecessor, and the issue will, therefore, contain a photographic illustration of every type of ship authorized, building or completed since the Spanish war, with a complete description of its construction, armor, armament and general fighting qualities.

A special chapter will be devoted to the remarkable work accomplished by the Bureau of Ordnance in designing for our new warships entirely new guns of unprecedented power, the pieces ranging from the 40-caliber, 12-inch rifle down to the 50-caliber, 3-inch piece which will enter so largely into the make-up of our modern batteries. The naval lists, which were a popular feature in the former number, will be brought up to date, and we shall present a comparative table showing our present fighting strength compared with that of other navies of the world.

By way of marking the great stride made by our navy in the brief three years since the war, we may mention that the aggregate displacement of battleships, monitors and cruisers in commission during the war, omitting the hastily improvised auxiliary fleet, was a little over 153,000 tons, whereas the double-page drawing showing all the new ships put in commission since the war, and all the ships at present authorized and under construction, represents an aggregate displacement of over 313,200 tons.

In other words, the addition now being made to our navy is over twice as great, measured in displacement, as the actual fleet that won the Spanish war. To this must be added the fact that in range, power, and accuracy the new guns of this modern navy are at least 100 per cent superior to the low-velocity, smoke-producing weapons of Santiago and Manila Bay.

A COMPOUND CONDENSING STEAM CARRIAGE.

We do not know of a more promising subject of investigation for the practical mechanic than that of the production of a suitable condenser for the steam-driven automobile. Manufacturers of the steam carriage have made wonderful progress in the development of the type, and considering the inherent difficulties of the problem, the steam carriage to-day exhibits an ingenuity and skill in its design not excelled by that of any of its competitors. There are few prettier pieces of mechanism to be found than the compact, powerful little two-cylinder, Stephenson link-motion engines which are almost universally used on the steam automobile of to-day. The boiler and various regulating appliances, automatic or otherwise, are the result of most careful thought and reflect the greatest credit upon the makers. Type for type, and considering the limitations under which each type labors, the steam carriage of to-day, as a piece of mechanical design and construction, is fully abreast of its electric or gasoline-driven competitors.

The radius of action, as far as it is governed by fuel capacity, is much greater than that of the electric and not far short of the internal-combustion-motor machines; but when we come to the question of water capacity, we find that the steam-driven type, while about on a par with the electric, is still far short of that of the gasoline type. It has long been recognized by the makers that as soon as a satisfactory condenser can be devised, the radius may be increased to almost any extent desired, and this for the reason that the water instead of being thrown away in the form of exhaust steam, will be pumped back to the boiler, and perform a continuous cycle through boiler, engine, and condenser, the replenishing of the water tank taking place at long intervals, the loss being only such as is due to leakage and evaporation. In addition to the advantage of increased radius of action, the provision of a condenser would, of course, result in great fuel economy, a large portion of the heat being returned to the boiler.

There are, however, well-understood difficulties attending the design of a suitable condenser. There is the increased weight; there is the difficulty of separating the oil which will necessarily be carried over from the cylinders; and there are the well-known difficulties attending the pumping of hot water, that is approximately at the boiling point, into the boiler. Judging from an experimental condenser which a member of our staff fitted to his steam-driven machine, merely for the purpose of reducing the clouds of exhaust steam in cold weather, it should be quite practicable, by making use of aluminium piping and a suitable system of flange or pin-cooling devices, to secure sufficient surface to condense all of the steam. While an air-cooling condenser would, of course, add appreciably to the weight, the increase would be by no means prohibitive, nor would it even begin to offset the gain in economy and in radius of action that would be secured. Of course, the chief difficulty, if air-cooling were used, would arise when the machine is doing its maximum work in hill-climbing. At such a time it might be necessary to increase the air current by means of a rotary fan; but even supposing that condensation during hill-climbing were only partial, the worst that could happen would be the loss of a portion of the water in the form of uncondensed steam. Furthermore, the provision of a successful condenser for the steam carriage would open the way for other important improvements tending to increase the power and efficiency of the motor. The water-tube boiler, higher steam pressures of from 250 to 300 pounds to the square inch, and the use of multi-cylinder engines, compound or even triple-expansion, would be improvements which would tend to bring the performance of the engine and boilers nearer to the economy which is realized in marine practice.

Having said this much, however, we must bear in mind that there is one radical difficulty which would immediately present itself if the exhaust were turned into condenser. At present the large steam-raising capacity of the steam-carriage boiler is due in considerable measure to the fact that the exhaust is used to induce a strong draft through the burner and tubes, and if the exhaust were directed to the condenser, some other means of increasing the draft, or some other form of boiler, would have to be resorted to. Of course, sufficient draft might be secured by a rotary fan; but as our proposed condenser already calls for a cooling fan, it can be seen that the accessories of the new design would be beginning to multiply beyond the point of working practicability. However, after all is said and done, it must be admitted that the problem is a very live one, full of interest and promise to the inventor who can work it out to a practical solution.

M. SANTOS-DUMONT'S PLANS TO CROSS FROM NICE TO CORSICA.

INTERVIEW BY OUR PARIS CORRESPONDENT SPECIALLY FOR THE SCIENTIFIC AMERICAN.

The Paris correspondent of the SCIENTIFIC AMERICAN had the opportunity of meeting M. Santos-Dumont shortly before his departure from Paris, and made a visit to the balloon shed at the Aerostatic Park in company with the aeronaut. The famous "No. 6" is being dismounted and made ready to be taken to Nice, where the experiments are to be carried on during the winter under more favorable conditions than at Paris. Speaking of his present balloon, which has a double silk envelope, M. Santos-Dumont says that he had considerable difficulty in preventing it from folding together during certain maneuvers, owing to the insufficience of the ventilator which sends air into the small interior balloon. In fact, when the balloon is afloat it is submitted to differences of temperature according to the layers of air which it traverses; and in consequence of the endosmose which takes place in spite of all precautions, the gas leaks and a balloon of elongated form is always in danger of folding in the middle. This he knew from past experience, and accordingly provided the No. 6 with an interior air-bag which is more or less filled by a ventilating fan attached to the motor, and keeps the main balloon expanded out. The ventilator, however, did not prove all that was desired, and so he had hard work to keep the balloon in proper shape. The Buchet petroleum motor which he uses has also caused him considerable trouble. It has four cylinders mounted on the top of a long crank-box in aluminium. Once in the air, as a general rule, only two out of four cylinders worked, and this left him naturally at a great disadvantage. With this motor he counts upon 18 horse power, but as this is often cut down one-half he cannot make the balloon go through the evolutions he wishes. The Longuemare carbureter has always worked very well in spite of the considerable inclinations which it takes due to the varying position of the balloon. The carbureter is regulated by a wire which passes to the car. It will be remembered that the motor is at one end of the frame and the car at the other; the aeronaut is thus at a considerable distance from the apparatus, and uses a number of wires to carry out the maneuvers. A small pilot-wheel thus carries two wires which pass upward and then back to the rudder. In place of taking sand as ballast he now uses water, and this is contained in two long pointed cylinders mounted in front. Each cylinder, which contains 6 gallons, may be emptied gradually by a valve from which a wire passes to the car. The aeronaut is obliged to use a guide rope weighing 110 pounds and 150 feet long, which hangs down from the front end of the frame. This often causes difficulties by dragging upon the ground or catching upon the roofs of houses.

M. Santos-Dumont is now preparing to carry out a series of experiments on a much larger scale upon the Mediterranean, and will soon be ready to go to Nice. At present he is making great preparations for his new experiments, and is to have a large balloon house constructed upon a piece of property which has been offered to him for the purpose on the coast near Monaco. The shed will be 150 feet long and 80 high, much larger than that at the Aerostatic Park, and near it will be installed a hydrogen generating plant. The present balloon, No. 6, has already been emptied of gas and packed up and the framework will be transported as it is upon two flat cars. The aeronaut has already commenced the construction of a new balloon, the No. 7, which will be 30 feet longer than the No. 6 and built especially with a view of obtaining high speed. It is a much more powerful air-ship than the former in every way, and measures 120 feet long and 18 feet middle diameter. The same general shape is preserved, but the new balloon will be of a more elongated form than the other. The framework will be also 30 feet longer, making 85 feet, and will weigh about 140 pounds. The series of balloons has thus been gradually growing larger; the first balloon of 1898 gaged only 225 cubic yards. Since this he has made five others, increasing in size, and the present balloon is again an increase of 250 cubic yards over the precedent, or 1,030 cubic yards. Two screws are to be used, one at each end. They are 15 feet in diameter and driven independently by 45 horse power motors, thus giving 90 horse power in all, and a very high speed may be expected. This time he will use gasoline for ballast, and it will be used to feed the motors and thus be consumed instead of thrown overboard. Hence he expects to be able to stay in the air longer and cover long distances. The car, instead of being near one end, will be placed in the middle of the framework and the motors mounted one at each end, near the helices. In this way a much better balance will be obtained. The frame will hang as before from the balloon by steel piano-wires, and owing to the better equalizing of the strain there will be much less danger of tearing the balloon at the points of attachment to the silk. M. Santos-Dumont expects to occupy the next three months in making experiments in the bay of Monaco, and will then try to cross the Mediterranean from Nice to Corsica. This trip he is confident of being able to carry out, and he expects to make the passage in one-half the time taken by the steamers. He expects to be ready to carry out this project about the end of February. If it is successful the next step will naturally be to cross to Africa.

FURTHER TESTS AT SEA OF THE BELLEVILLE BOILER.

Following the test between the two cruisers, "Hyacinth" and "Minerva," of the British navy, from Gibraltar to Portsmouth, to ascertain the respective advantages and disadvantages of the Belleville and cylindrical boilers, the results of which we published in the SCIENTIFIC AMERICAN of October 5, another contest has been carried out between these two ships, and again the Belleville has been defeated. The course was from Cape Finisterre in Spain to Berehaven in the southwest of Ireland. Both vessels started level, but the "Hyacinth," equipped with Belleville boilers, at first forged ahead. After two hours' steaming the "Hyacinth" was traveling so well that she soon left the remaining vessels of the Channel Squadron, which was accompanying the test, far in the rear. It was considered in view of the speed at which the "Hyacinth" was traveling that she would establish a steaming record. The cylindrical boiler vessel, "Minerva," however, although she was at first left behind, when once she had got full steam up rapidly drew level with the "Hyacinth," and easily contrived to keep up with her, even with her engines eased down. The "Minerva"

then put on full steam once more and fairly raced away from the "Hyacinth," reaching Berehaven long before her rival. The test of the Belleville boiler on the "Hyacinth" on this occasion was unusually severe. Every ounce of steam was requisitioned, and extra men were sent down to the stokehold to assist in the trimming of the fires and the working of the bunkers. One of the after group of boilers primed to such an extent during the run as to render it necessary to draw the fires. Again there was the excessive and unaccountable loss of feed water which characterized the run from Gibraltar to Portsmouth. The loss of water on the comparatively short run between Cape Finisterre and Berehaven was over 50 tons.

THE NATIONAL ACADEMY OF SCIENCES.

BY MARCUS BENJAMIN, PH.D.

The scientific session of the National Academy, which is held in the autumn, began its meetings at the University of Pennsylvania, in Philadelphia, on the morning of November 13. Alexander Agassiz, the President of the Academy, and Asaph Hall, its Vice-President, were unavoidably absent, in consequence of which the Foreign Secretary, Ira Remsen, President of the Johns Hopkins University, presided over the sessions.

It is not customary to open the meeting with an introductory address, but to proceed immediately to business, in consequence of which the reading of the papers was promptly taken up.

These included a paper by George F. Barker, of the University of Pennsylvania, on "The Monatomic Gases." He explained the difference between diatomic and monatomic molecules, and of the positive and negative elements. He described the history of the discovery of helion, neon, argon, krypton, and xenon, and the fulfillment of William Ramsay's remarkable prediction made in his address before the Chemical Section of the British Association for the Advancement of Science, at Toronto, a few years ago, as to the existence of the gas called Neon, and its exact relationship to the others in the same series. These gases are all monatomic, having only one molecular motion, and are incapable of combination with any other elements. He said that they were the equivalents of zero, or of nothingness. In mathematics one may go from the negative to the positive, or the opposite, by passing through zero. This series of elements was placed equidistant between the negative series, in which were hydrogen and the haloids and the positive series, in which were lithium, sodium, and the other alkalies.

The "Transmission of Heat Through Vapor of Water at Small Pressures" was the title of a joint paper by Edward W. Morley, of Adalbert College, Cleveland, with Charles F. Brush, the well-known electrical expert. It gave a series of results of experiments made by the authors. Prof. Morley also presented a second paper descriptive of "Two Forms of Gage for the Recording of Small Pressures of Gas," which were especially devised in order to measure the pressure of aqueous vapor. With these gages it is possible to make measurements in which the mean error of a single reading is not much greater than a ten-thousandth of a millimeter. The description of the apparatus as given by Prof. Morley was highly technical, and was illustrated by means of drawings, which he presented before the Academy.

Charles S. Pierce, of Milford, Pa., presented a paper on "The Logic of Research into Ancient History." He contended that the logical procedure on which students of ancient history had worked was as bad as logic could be. No new truth ever came from induction or deduction, but can come only from abduction. The correct method, he said, is that our hypothesis ought to explain all the related facts. It is not sufficient to say that testimony is not true. It is our business to find out how it came to be such as it is. After testing our hypotheses, they should not be abandoned until conclusively refuted. There is no practice more wasteful than that of abandoning any hypothesis once taken up, until it becomes evident that it is quite untenable. A hypothesis being accepted on probation, the process of testing it should consist in examining such of the consequences of the hypothesis as will be capable of direct verification rather than in examining the facts to see how well they accord with the hypothesis. Mr. Pierce illustrated his propositions by a number of false hypotheses, which he took from the published lives of Aristotle and Pythagoras.

Henry F. Osborn, Professor of Biology in Columbia University, presented a paper on "Dolichocephaly and Brachychephaly as the Dominant Factors in Cranial Evolution." Prof. Osborn announced that after studying the fossils of the rhinoceros found in this country and abroad, he found the grouping of the rhinoceros fossils to be largely false, and reached the conclusion that the length of limb and the proportions of skull of the fossilized rhinoceros were correlated. His recent study on American fossils led him to apply this principle, and he found it exceedingly useful in studying any heterogeneous group, the inter-relationship of which is not at once entirely clear. His deductions were that there was but very little doubt that the first step in the production of long skulls is connected with the elongation of the limbs and feet, which is caused by the moving about of the animal over a large extent of country in search of food. Then the lengthening of the skull follows, especially in grazing animals, by reason of the necessity of bringing the front teeth nearer to the ground. His conclusion was that it might be laid down as a fundamental principle, unless there be some compensating cause producing a different outcome, that, giving these conditions, the result as announced by him would always be brought about. Prof. Osborn also presented brief papers on the "Cranial Evolution of Titanotherium, II," and on "Latent and Potential Homology," which were the results of his recent studies in vertebrate paleontology.

"Observations on Tungsten" was the title of a paper by Edgar F. Smith, of the University of Pennsylvania, who has undertaken a careful study of the various tungsten-bearing minerals for the purpose of ascertaining precisely to what extent hitherto unobserved quantities of iron, manganese, vanadium and phosphorus are compounds of these minerals, as he believes that the various determinations of the atomic value of that element is due to the errors caused by failure to determine these unobserved elements in the minerals. His paper was largely of the nature of a preliminary announcement.

Dr. Horatio C. Wood, Jr., of the Medical Department of the University of Pennsylvania, read a paper on the "Vaso-Motor Supply of the Lungs." He said that while it had long been known that the general blood vessels of the body were controlled by nervous mechanism, still this had not been shown to be true of the blood vessels of the lungs, and this proposition he sought to establish, contending that the blood vessels of the lungs were in fact supplied with vaso-motor nerves, and that these were affected by the administration of drugs in a manner different to that in which any other blood vessels of the human body were affected. Dr. Wood expressed the opinion that the discovery regarding the vaso-motor nerves of the lungs would have a considerable value in practical medicine, and might influence particularly the treatment of pneumonia, a disease that temporarily affects the caliber of the blood vessels, which condition might be counteracted by the use of certain drugs.

Prof. Samuel L. Penfield, of the Sheffield Scientific School of Yale University, presented a paper "On the Use of Stereographic Projection in Making Accurate Maps; with Criticism of Some Recent Methods of Map Projection," which he illustrated with a series of photographs reflected upon a screen. He contended that for accuracy and ease of geographical and geodetic measurements it afforded very great advantage over the polyconic method and Mercator's projection. Known to scientists hundreds of years ago, the wonder was that the stereographic method had fallen into disuse. In its principles it was absolutely exact, and for the navigator made it possible to save considerable distances in laying a course, as compared with the ordinary marine charts. In all flat projection there must, of course, be greater or less distortion of dimensions and outlines; but the distortion under the stereographic system was insignificant in contrast with that under the system that prevailed in most modern atlases, where arbitrary circles instead of the true great circles of the earth were employed as parallels.

In addition to the foregoing, George F. Becker, of the United States Geological Survey, presented papers entitled "Note on Linear Force Exerted by Growing Crystals," and "Note on the Organic Theory of Tilted Blocks," but, as he was not present, his papers were read simply by title.

A joint paper by S. Weir Mitchell, the celebrated neurologist, and Simon Flexner, of the medical school of the University of Pennsylvania, bearing the title "Snake Venom in Relation to Hæmolysis, Bacteriolysis and Toxicity," as well as a paper "On the Nature of Double Halides," by Ira Remsen, of the Johns Hopkins University, and one "On the Pseudo-catalytic Action of Concentrated Drugs," by James M. Crafts, of the Massachusetts Institute of Technology, were presented by title only, or with a brief statement of their contents by the authors.

Two biographical memoirs of deceased members were presented before the Academy. The first of these was a memoir of Frederick Augustus Genth, by George F. Barker. Prof. Genth came to the United States as a young man, and after filling various professional chairs, was ultimately called to the charge of the Chemical Laboratory in the University of Pennsylvania. His skill in chemical analysis gained for him a high reputation, and he was analyst for several State geological surveys, acquiring a very high reputation as an expert in the domain of mineral chemistry.

The second biographical memoir presented was one on Gen. John Newton, by Cyrus B. Comstock. Gen. Newton was a distinguished army engineer, and held high rank during the civil war, commanding a corps at Gettysburg and in the later Virginia campaigns. He became chief of engineers, and during his administration had charge of the explosions at Hell Gate. Subsequent to his retirement, New York city became his home.

The social features of the meeting included a reception by Provost Harrison and Mrs. Harrison, of the University of Pennsylvania, at the Free Museum of Science and Arts, and a dinner given at the Hotel Bellevue, by Dr. S. Weir Mitchell, at which more than thirty of the members were present.

The meeting was remarkably well attended, nearly half the members of the Academy being present at the sessions, which were adjourned at the conclusion of the reading of the papers on Thursday.

The next stated meeting of the Academy will take place in Washington, in April, 1902.

DR. STEIN'S TRAVELS IN CHINESE TURKESTAN.

Dr. M. A. Stein, the well-known explorer who recently returned from Chinese Turkestan and his researches among the buried cities of Asia, has discovered much valuable unknown information regarding the culture and daily life of those cities which for two thousand years have been immersed in the sand, and about the history of which comparatively nothing is known. The expedition was productive in the discovery of a large quantity of sculpture, fresco paintings, objects of industrial art, seals and so forth, dug out of the buried temples and houses, which afford a valuable link in the history of ancient China, India, and the West. A very comprehensive idea has also been gained regarding the extent of the advancement of the Turkestan desert. Some of the settlements excavated by Dr. Stein were found to be as much as 100 miles beyond the edge of the present cultivated area. From the results of his investigation the explorer opines that the inhabitants of these places were in possession of a culture mainly derived from India, and that they were Buddhists. The excavations prove that their culture was highly advanced, and that the art influence of Greece and Rome was felt even at that great distance from the classical centers. The most striking excavations were made in the heart of the desert north of Niya. There one settlement was exposed, covering with its scattered dwellings and shrines an area of about twenty-four square miles. Until digging began all that was visible were weird-looking rows of bleached timber pieces, projecting in various places like the framework of a wrecked ship from between the sand dunes.

The refuse-heaps which were unearthed near some ruined houses were specially interesting. These domiciles were apparently tenanted by village officials. The refuse heaps contained hundreds of documents, beautifully written on wooden tablets and carefully tied and sealed. Owing to the preservative nature of the sand, many of these were in splendid condition—the ink as black, and the seals and string as perfect, as if they were only a few weeks old. As these documents are in a known Indian script, their decipherment can be expected to reveal in a fascinating manner many of the details of the ancient village life. But it will be a task requiring years of close study, as in India itself the materials available of this early script have so far been very scanty.

Round most of the sand-buried houses were discovered carefully-planned little gardens, with avenues of trees, fenced lanes, orchards, and so forth. On clearing away the sand under the shriveled hedges were brought to light heaps of dried leaves, just as they had fallen in ages gone by. The gardens were much the same character as those found in Turkestan to-day. The trees were mostly poplars, peach, mulberry, and apricot. There is no evidence that these settlements were abandoned owing to any sudden catastrophe, but that their gradual desertion was due to the impossibility of continued irrigation, causing an advance of the sand.

GERMAN PORT OF EMDEN.

Mr. Jackson, secretary of the embassy at Berlin, under date of September 25, 1901, reports that the new port of Emden has been opened. The Reichsanzeiger says that this port can accommodate the largest seagoing ships. The inner harbor has everywhere a depth of more than 6 meters (19.6 feet), while the depth of the outer harbor at mean high water is more than 11 meters (36 feet), so that it can accommodate ships drawing 8.2 meters (26.8 feet) at all times. The harbor will be kept open in winter, and the channel of the Ems from Emden to the sea is to be made 10 meters (32.8 feet) deep. Quays have been built in the outer harbor; electric cranes, coaling chutes, etc., have been provided. The outer harbor is a free harbor, and provision has been made for the loading and unloading of goods and for storage, with comparatively little supervision by the customs authorities.

As between pneumatic riveting and hand work, an English engineer says that with the former men drive 500 rivets per working day, while with the latter only 250 rivets can be driven, but the size of the rivets is not given.

CABLE LAYING IN THE PHILIPPINES.

BY FREDERICK MOORE.

When Manila fell there were practically no telegraph or cable connections anywhere in the Philippines. The system of land wires connecting the principal towns, and the cables between Iloilo and Manila and Iloilo and Cebu, had been sealed and abandoned by their owners, the Eastern Extension Australasia and China Cable Company, which announced that it would not open them until the United States could insure protection to its employés and property.

The question of wires soon assumed a serious phase. Indeed, the trouble began with the capture of the place, and the first hostile act of the insurgents was the destruction of the wires our forces had hurriedly strung between the different detachments about the city. Upon Aguinaldo's taking the warpath, it became useless to stretch land wires unless the army surrounded them or they were guarded by a line of troops close enough to shout the message along. The system abandoned by the Eastern Extension Company fell into his hands, and he developed and extended it with considerable ability, utilizing barbed fence wire at times. The Filipinos knew the value of wires, and when they were driven back from theirs would destroy them, and quite often a few would slip through our lines and carry off as much as possible of the wires we had strung. Cable was soon discovered to be much easier to maintain, for the Filipinos had no picking-up gear or grappling and cutting utensils. The War Department decided to establish a complete cable system between the islands, with alternates, as soon as possible. Contracts were placed, the work rushed, and the "Hooker," the first Philippine cable ship, dispatched post haste, taking on part of her equipment, which was procured in England, at Gibraltar.

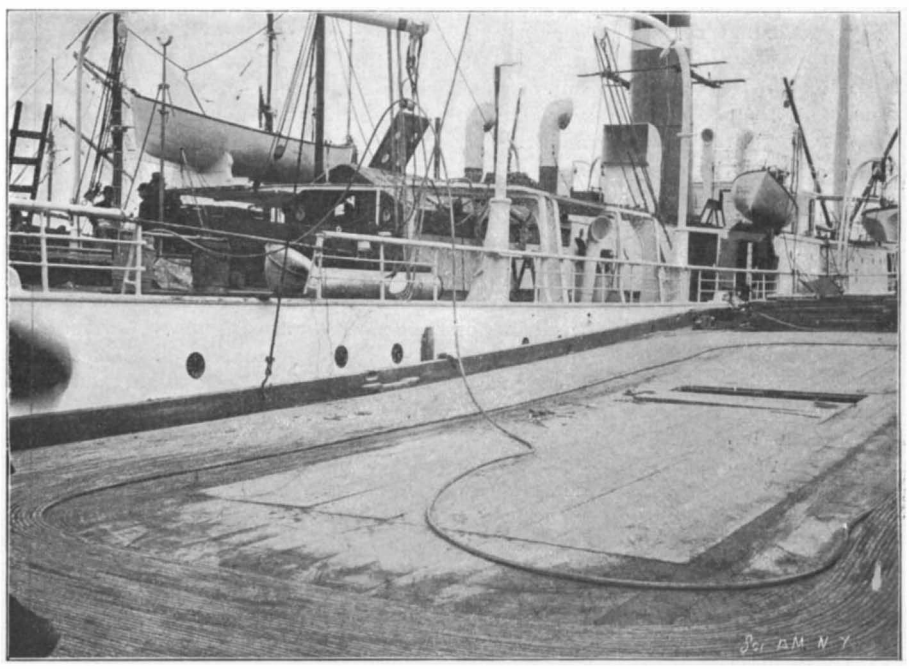
The problem of securing a satisfactory force had been by no means an easy one, for the business of cable-laying is new to the United States. The services of Mr. Otto Strubel, an engineer of the French Cable Company, and those of Mr. Henry Winter, an officer of the Anglo-American cable ship "Minia," were secured. Only three men of the "Hooker's" crew had had experience in cable work. An expert jointer of rubber cable was enlisted in New York, but he deserted the expedition a few days before it left. Care had been taken, though, to have two sergeants of the signal corps instructed by him in case of such an emergency.

After arriving at Manila the "Hooker" was sent to Hong-Kong to coal, struck an outlying reef of Corregidor Island, and down went ship, cable and all equipment. The ship was a total loss, but most of the cable and the equipment were recovered and taken back to Manila. The "Romulus" was chartered and equipped with the recovered paraphernalia. For work in the rivers and lagoons, barges were equipped and towed by shallow-draft gunboats. The gunboats could repel disturbers, and the same exposure was not required in reeling out cable as was necessary in stretching land wires. Every five miles stops would be made to test the cable. The small military force which accompanied these expeditions when in hostile country would be deployed, while the electricians landed to make the tests. For the actual work of establishing the lines natives were employed. It takes three natives to do the work of one American, but the native only asks a salary of $5 per month and his accustomed fare of rice, dried fish, etc.

The first work was done by the army, but subsequently contracts for the entire work were let for laying the cable as well as furnishing it. The government furnishes the cable ship, the necessary military protection, and an officer as inspector. More than 2,500 miles have been laid, almost enough to reach from San Francisco to Honolulu. All the principal cities and all the large islands have been joined. To be more explicit, cables connect Manila and Cavite, Taguig and Calamba, Taguig and Binang, Calamba and Los Banos and Santa Cruz, Liloan and Ormoc, Cebu and Liloan, Leyte and Tacloban and Samar, Naic and Corregidor, Guinayangan and Pasaco, and other points from the islands of Cebu to Bahol, Negros to Cebu, Cebu to Mindanao, Jolo to Mindanao, and also connecting points on the islands where land wires cannot yet be maintained.

A curious protest was offered when the first military cable was laid—that from Cavite to Manila. The Eastern Extension Company had acquired a new franchise from Spain just before the war, with the sole right of cables in the Philippines. The franchise lasts until 1940, and a clause in the contract provides a payment of £5,000 for each year before that date that other cables shall be used. The company made a claim upon the United States for the amount, but the claim will be ignored for reasons connected with the disposition of the cable at the beginning of the war.

A few days prior to the opening of the war, under an emergency contract with the Spanish government, the company extended its Hong-Kong cable, which landed on Luzon, at Balinao, to Manila. Admiral Dewey endeavored in vain to obtain a neutralization of this cable. He therefore cut it.



Loading Cable on Board Transport "Hooker," at Brooklyn.

Transporting Cable to the Docks.

Landing the End of a Cable by Small Boats.

Laying Cable from Barge Up a Small River.

LAYING CABLE IN THE PHILIPPINES.

Use of Low-Grade Fuel in Sweden.

A Swedish paper states that in the new briquette factory at Elmhult, belonging to the state, experiments will be made this fall in the production of a cheap and practical fuel for Swedish railroads. In locomotive furnaces Swedish coal cannot be used alone, because it contains too much scrap and incombustible substances, which are not consumed, but form offal and ashes. It must, therefore, be mixed with English coal, but this is becoming more and more expensive. The above-mentioned factory has been built to be employed in the attempts to make or refine Swedish coal into a good fuel. The factory will operate according to a German patented method, and has been put up under the supervision of a German. It will be started this fall, and the work will continue night and day. It is calculated that the output will be 36 briquettes per minute—that is, 51,840 per 24 hours, or 15 carloads of 10,000 kilogrammes per car. Experiments will first be made with 40 carloads of Swedish coal of the lowest grade.

A new system of steel roofing has been patented which may displace galvanized iron for roofing purposes. The system of manufacture consists of steel strips bent cold in the press, the covering being formed of plain galvanized sheets bent back on the edges and locked into tubular rafters.

NEW CONCRETE ARCH BRIDGES AT NIAGARA.

BY ORRIN E. DUNLAP.

The new concrete arch bridges built on the New York State Reservation at Niagara Falls to connect the mainland with Goat Island have been completed, and are numbered among the prettiest structures in that locality, where grace and beauty, as well as utility, form the features of the notable bridge work. These bridges are two in number. One of them extends from the mainland across the turbulent upper rapids to Green Island, while the other, the shorter of the two, connects Green Island with Goat Island. To many Green Island is better known by its old name of Bath Island, and the knowledge of the fact that the name of the island has been changed will aid many who have not been recent visitors to the Falls better to locate the position of the new bridges. It will be recalled that the bridges were commenced in the summer of 1900, and a reference to the SCIENTIFIC AMERICAN of September 22, 1900, will show the early stages of the work. While strenuous efforts were made on the part of the contractors, W. H. Keepers & Company, of New York, it was found impossible to complete the bridges last year before winter set in.

With the completion of the temporary bridge the trusses of the old bridge were removed as desired. The piers being in place, timber forms were erected for the arches as shown in the illustration. The placing of this lagging was a tedious task. The lagging was surfaced with a coat of plaster, and on this cheese-cloth was pasted, an operation necessary in order that a clear separation be obtained between the lagging and the concrete of the soffit of the arch. The steel ribs were then placed, the flat bars being held together by bolts, and spaced two feet apart. The iron bars extend into the concrete three inches at the top and bottom, while the bars have three-foot centers. The arches are partitioned off longitudinally into sections 9½ feet in width, four of these sections to a span. In laying the concrete, one of these sections constituted a day's work for the night and day shifts. A very clear idea of how the first section of concrete was placed may be obtained from the illustrations. The work progressed with rapidity, and the structure was opened early in July.

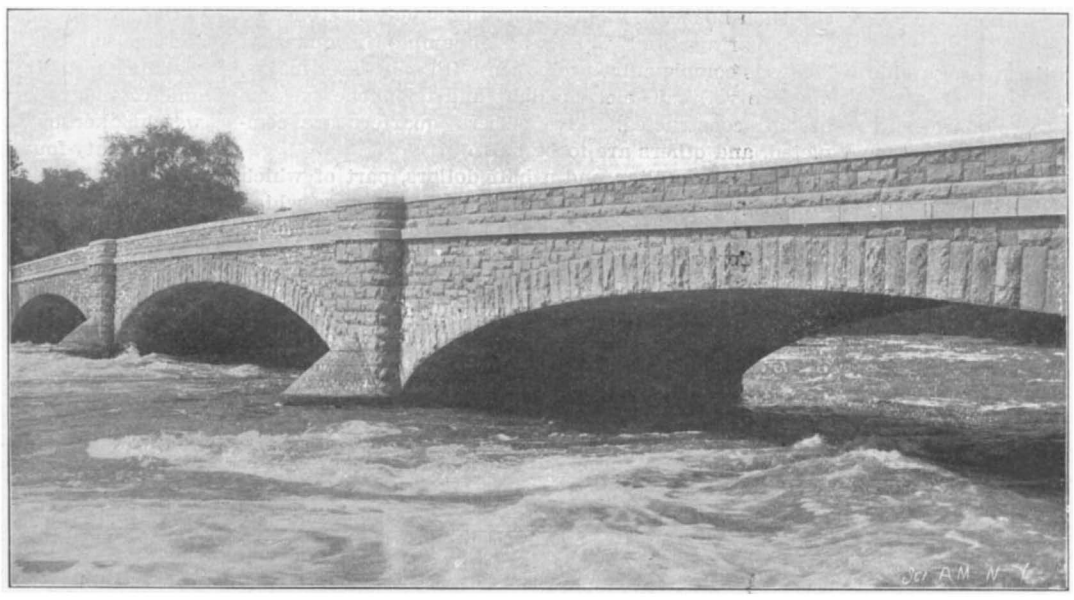
The bridge between the mainland and Green Island is 371 feet long, which length includes the finishing panels. It has three spans, each of the end spans having a length of 103½ feet, and the center span being 110 feet long. The rises of the end spans are 10 feet, and the rise of the center span 11½ feet. The piers have a width of 13½ feet and a length of 53½ feet. On the upstream end of each pier is a granite nose or ice breaker, which is expected to serve as protection to the bridge during the heavy flow of ice from Lake Erie in the springtime. The width of the roadway of both bridges is 20 feet, and on each side of the roadway is a granitoid walk 9½ feet wide for pedestrians. The space between the spandrel walls is filled with cinders and earth, the roadway on top being composed of about a foot of bank gravel.

The bridge connecting Green Island and Goat Island also has three spans. The length of the end spans is 50½ feet, while the center span is 55 feet long. The piers of this bridge have a width of 8 feet, and they are 50 feet 5 inches long. The upper ends of these piers are also fitted with granite ice-breakers The general finish of this bridge in the matter of walks, roadway parapet walls, etc., is identical with that of the bridge between Green Island and the mainland. Neither of the bridges will have an iron railing on the side walls.

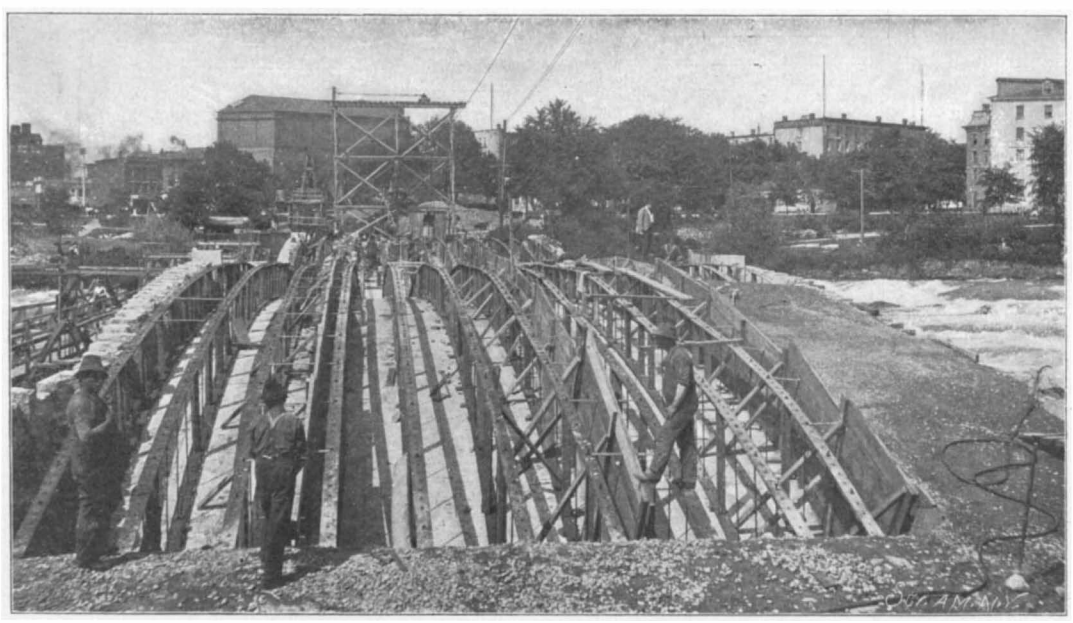
In the construction of the bridges two grades of concrete were used. For the arches between skewbacks the proportions were one part Portland cement, two parts sand and four parts broken stone or gravel which would pass through a 1¼-inch ring, including the total product of the crusher between 1¼ inch and ¼ inch. For the foundation abutments, piers and spandrels, the specifications called for one part Portland cement, three parts sand and six parts broken stone or gravel, which would pass through a 2-inch ring, including the total product of the crusher between 2 inches and ¼ inch. It was also provided that in the last-named portions of the structure large stones containing not less than 1½ cubic feet each might be placed in the body of the piers and abutments, each stone to be placed on its broadest bed and not nearer than 8 inches to another stone or to the face of the work.

The stone facing covers the entire structure, including the piers and abutments below water, the exceptions being the intrados of the arches between the ring stones on each face and the portion of the abutments concealed in the banks. There are pilasters over each pier with a projecting belt course at the top, on top of which is placed the coping. The ring stones run from 18 to 24 inches in the bridge between Green Island and Goat Island to 36 to 42 inches in the bridge between Green Island and the mainland. Every fifth stone is a header and extends into the work 18 inches. Drainage for the bridges is provided by wrought-iron pipes laid in the concrete and running from the center of each space over the piers to the soffit of the arch near springing line. Over the piers the concrete is so formed that all water that seeps through the filling will be drained to the pipes.

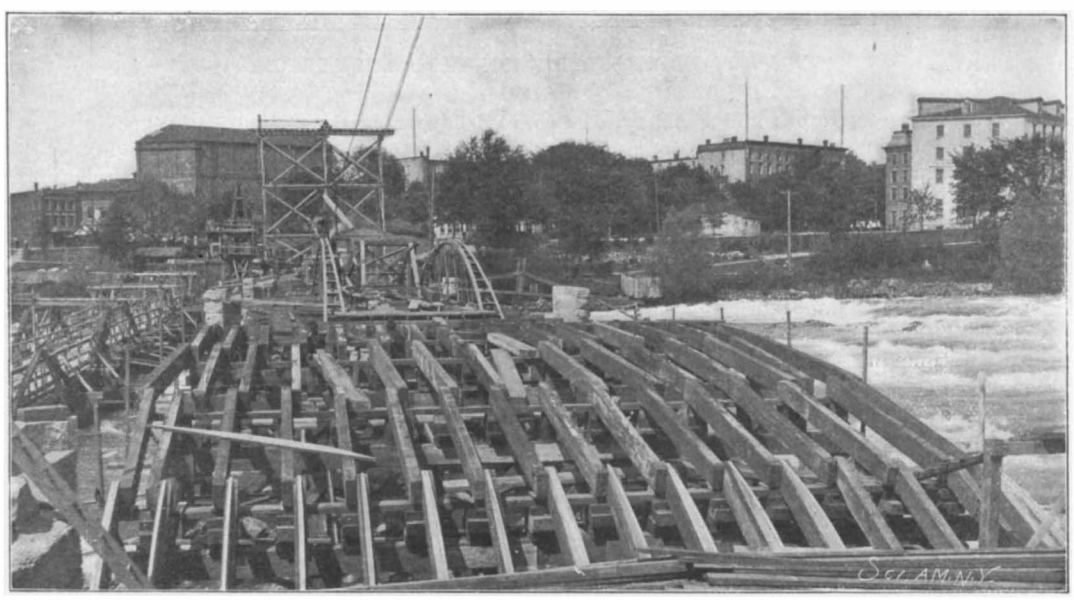
In making comparisons and in seeking the general beauty of the structures it is probable that the bridge between the mainland and Green Island will have favor. The spans of this bridge are much longer and they add a grace that is pleasing. However, both of the bridges are handsome structures, and portray a construction which it would seem is destined to become exceedingly popular, especially in such scenic places as Niagara, where harmony with nature is essential to the general beauty. When it is recalled that the location of the bridges is within about 500 or 600 feet of the brink of the American Fall, and that they have been erected right over the upper rapids, the fact that they have been completed without loss of life in the wild waters is to the credit of the care of the contractors and men engaged on the work.



THE CONCRETE ARCH BRIDGE FROM THE MAINLAND TO GREEN ISLAND, NIAGARA FALLS.



SHOWING THE STEEL RIBS AND METHOD OF LAYING THE CONCRETE.



TIMBER FALSEWORK FOR NIAGARA CONCRETE ARCH BRIDGE.

Dry Washing.

It is a familiar boast of English people that we are above all others a washing nation, says The Lancet. Soap-and-water is a standing dish in Great Britain, but so little were we disposed to credit the habitual cleanliness of foreigners that a piece of soap in the valise was till recently the habitual companion of an Englishman on his travels. Nowadays such an item is scarcely a necessary part of the traveler's impedimenta, though there are still fair-sized hotels on the Continent where soap may be searched for in vain in the bedrooms, while the smallest inn in this country would blush to the roof at such a deficiency. All kinds of theories have been raised to account for this national tendency to ablution, and most diverse qualities have been attributed to its possession. The familiarity of islanders with water, and the use of it occasioned by the national custom that led the ancient Britons to paint their bodies, are solemnly urged as the foundation of the English proneness to washing; and the fresh complexions and smooth skins of young Englishmen are held to replace the more dusky and hirsute countenances of the Latin races because of their closer and more frequent acquaintance with the articles of the washstand. With fanciful theories we have naturally no concern, and we believe that clear ruddy cheeks are a national inheritance for the same, if equally indiscernible, reasons as a tendency to roam or a dull ear for music. If, however, we do not attempt to explain the presence of a widespread habit and leave it to idle imaginations to determine why Englishmen wash, it is nevertheless our concern that such habits should be for the general welfare and should not be carried to injurious excess. It is quite obvious that even in England there are people who wash too little. It is not so generally recognized that some people wash too much. The skin is not well adapted to frequent applications of water accompanied by even the least irritating of soaps. A tendency arises to maceration of the superficial part of the epidermis, which is too frequently removed and occasions probably too rapid a proliferation of the cells of the Malpighian layer. There is no doubt that

many cases of roughness or the skin of the face come from the frequent applications of water. It is a good thing to rub the face with a soft, clean, dry towel two or three times a day. If, in addition, water is used in the morning and at night the skin will be kept in a sounder, smoother, and healthier state than if, as is often the case, soap and water are used three or four times a day. Men are not often offenders in this respect, most men sparing little time for the refinements of the toilette. Women and children, whose skins are the most easily affected by superfluous ablution, are the very persons in whom such excess is too common. They should be taught that there are dry methods of cleanliness as well as wet ones.

THE PUGET SOUND NAVY YARD.

BY A. B. WYCKOFF.

In 1878 and 1879, while engaged in the hydrographic survey of Puget Sound, the writer tried to interest the naval authorities in having a naval reserve of two hundred thousand acres of government timber lands made. A bill was introduced in Congress, but the writer was ordered to China and the matter was dropped. The timber on such a reservation would now be worth several million dollars.

In 1888 Congress authorized the President to appoint a commission of three naval officers to select a site for a naval station north of the forty-second parallel of north latitude. After an exhaustive examination it selected 1,572 acres of land on Port Orchard, an arm of Puget Sound. Congress did not act upon this report, and in 1890 authorized a second commission of two civilians, two naval officers and one army officer, to select a site for a drydock north of California. It selected virtually the same location, embracing over seventeen hundred acres, which could have been bought at an average price of about twenty dollars per acre.

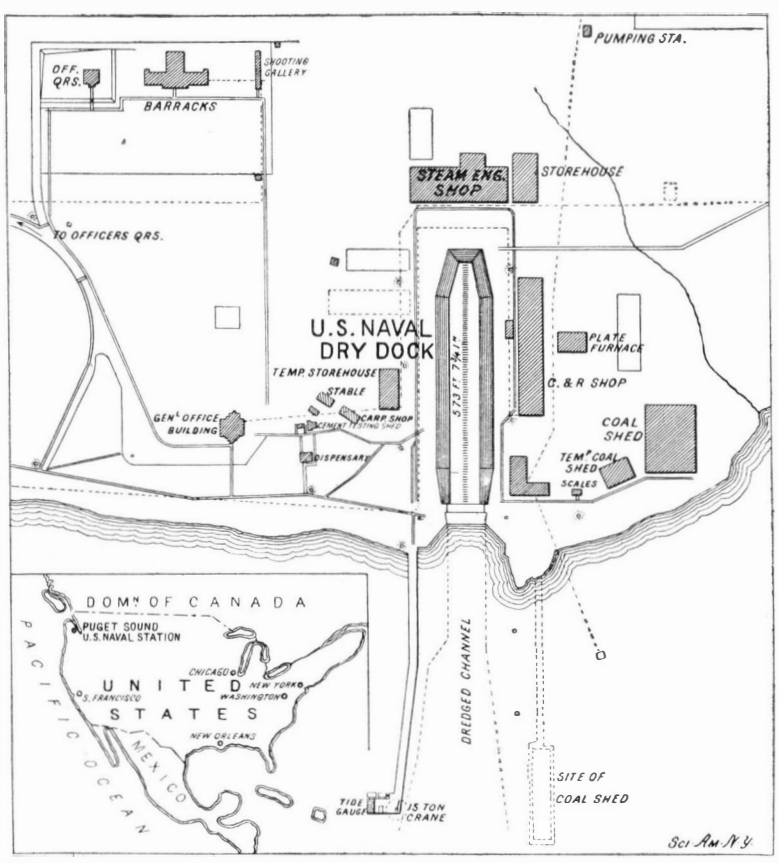
Through the personal popularity of the delegation from the new state of Washington, and by a narrow majority, the naval bill of March, 2, 1891, appropriated $10,000 for the purchase of a site, not to exceed two hundred acres, for a drydock, and authorized a contract for a dock not less than 600 feet in length, 70 feet in width at the bottom, and capable of receiving vessels drawing 30 feet of water, the total cost not to exceed $700,000. At this time most of the navy yards on the Atlantic coast were closed, and Congress did not desire another one. The restriction upon the amount of land purchased will probably prove a very expensive mistake.

March 17, 1891, the writer was ordered out from Washington to select the lands for the drydock. Owing to some legal complications it was June 2, 1892, before the final report was made. For the sum of $9,512.50, 190 acres was secured, and the "Puget Sound Naval Station," was established, with the writer as first commandant. Subsequently, in September, 1891, the name was changed to "Puget Sound Navy Yard."

October 29, 1892, the contract for the drydock was let to Byron Barlow & Co., of Tacoma, for $491,465. The plans were afterward somewhat changed, making the dock 650 feet long and extending the wing walls, which increased the total cost of the completed dock to $610,000. The drydock was begun December 19, 1892, and completed April 23, 1896, when the U. S. S. "Monterey" was docked. The drydock is located in a level basin with the entrance just inside the high-water mark. The strata show glacial deposit and the bottom is above a layer or bed of coarse gray sand. The entrance for about 70 feet is constructed of Sucia Island sandstone, while the remainder of the dock is of wood. The piles in the bottom could only be driven on an average about 8 feet. Although the "Oregon," "Iowa," and "Wisconsin" have spent six weeks at a time in the dock, it has not settled a quarter of an inch, and no repairs at all have been necessary. It was a fortunate action on the part of Congress to authorize this drydock, for otherwise our battleships built at San Francisco could not have been docked nearer than Japan. The "Oregon" was docked here and had her bilge keels put on just before starting on her race to Santiago. She is now again in this drydock to receive repairs to her bottom, which will take several months to complete.

The Puget Sound navy yard occupies a mile of water front on the north shore of Sinclair's Inlet, and is fourteen miles west of the city of Seattle. One-half of its area is embraced in two level basins just above high-water mark at the ends of the yard, while the intervening land rises in natural terraces to a height of over 200 feet, furnishing admirable sites for residences, hospital, chapel, barracks, etc. The drydock is at the eastern end of the yard, and all the working plant has grown up around it. The construction shop and pump house occupy the eastern side, the steam engineering plant the north end, and the ordnance and equipment buildings, for which appropriations have been made, will have the west side. The other shops and storehouses are in the immediate vicinity. A careful plan has been followed in arranging and locating all the working plant in close proximity to the drydock, so that work can be carried on with the greatest efficiency. The construction and steam engineering shops are complete in every respect, with foundries attached. They have the most recent and expensive tools, and any repairs can be made to a battleship. The large tools have their own electric motors, so that they can be run independently. There is a large pier or wharf, built on protected piles, near the dock, which will accommodate two battleships. Another pier extends out to the receiving ship "Nipsic," and farther still to the westward is the ordnance pier in front of the shell house. The present water-supply is from two large springs and wells and is ample in quantity. There is complete fire protection with salt-water mains, and the railroad, electric light and telephone systems are all constructed. Five officers' quarters are completed, and others are to be built.

About one million and a half dollars, part of which is unexpended, covers all the appropriations which have been made for this yard. As an influential member of Congress remarked, after a careful inspection: "The government has received full value for every dollar expended here, and no work will have to be done a second time." Until recently the development of the yard has been very slow, largely because of lack of knowledge of its great natural advantages upon the part of Congress and naval officials. This has now been largely remedied, as several of the Bureau chiefs of the Navy Department and many Senators and members of Congress have recently visited Puget Sound, and, without exception, have expressed themselves as greatly pleased with the navy yard. The present able and energetic commandant, Capt. W. T. Barwell, U. S. N., is very enthusiastic over the wonderful natural advantages it possesses. The Secretary of the Navy has recommended to the next Congress appropriations approximating a million and a half dollars for its further development.



PLAN OF PUGET SOUND NAVY YARD; BREMERTON.

There is no lack of excellent mechanics and workmen. Several hundred are employed in the yard, and a large proportion of them have their cottage homes in the adjacent villages of Bremerton, Charleston, and Sidney. A railroad can be easily and cheaply constructed to a connection with the transcontinental roads. But it seems hardly necessary, as the navy yard has terminal rates and loaded cars can be towed on barges across the Sound, as is done at the adjacent Port Blakely lumber mill, the largest in the world.

The developments during the last three years and its favorable geographical situation seem to assure that Puget Sound will have a larger ocean commerce and greater population than any other harbor on the Pacific Coast. For these and the following reasons the Puget Sound navy yard should be made the principal naval establishment of the Pacific.

It is the nearest point of the United States to Alaska, Japan, China, and the Philippines. It is situated on a perfectly land-locked harbor, where all the fleets of the world could ride in safety at single anchor. It is perfectly defensible and can be made impregnable by forts, torpedoes, and submarine mines. It is easy of access either day or night by the largest vessels afloat. It has over a mile of water front, where the tidal current is almost imperceptible. There is no sediment in the water, and consequently no dredging has to be done a second time. There is a good supply of fresh water from local springs, and a large fresh-water lake, only three miles distant, with an elevation of 146 feet. It is in proximity to the line of outer defenses of Puget Sound and accessible by disabled vessels, where they can repair in perfect safety. It is within seventeen miles of Lake Washington, where all the naval vessels of the Pacific can be laid up when out of commission as soon as the government canal, now being built, is completed.

A Remarkable Clock.

One of the most wonderful horological curiosities of the age has just been accomplished by a poor German watchmaker. It is a combination of an astronomical and calendar clock. The idea was suggested to the watchmaker by the famous clock at Strasburg Cathedral twenty-four years ago. The ingenious achievement of the poor German artisan represents no less than nineteen years' continual labor, and it is stated to be more wonderful than the horological monument at Strasburg, which prompted him to the effort. He was severely handicapped in his work by the lack of funds, but he devoted the whole of his savings to the task, completely ruining himself. The clock is inclosed within a glass case, so that every movement can be seen. It consists of 2,200 parts, 112 of which are wheels. The clock indicates the seconds, minutes, hours, dates, the days of the week, months, and the seasons of the year, the pictures of the signs of the zodiac, the sun, moon, and stars, and their rising and setting, as well as the exact position of the celestial bodies. It shows besides the moon's phases, and the eclipses of the sun and moon. The calendar is the most remarkable feature, since it is perpetual with perfect accuracy. At the beginning of the year it adjusts by itself the statements of the astronomical practitioners in explanation of the everlasting calendar, as well as Easter and the changeable festival days of the coming year. A glass ball, representing the spherical globe exactly, shows the movements and position of the planets Mercury, Venus, earth and moon, Mars, Jupiter, Saturn, and Uranus. The work is enhanced by over one hundred movable pictures and figures. Every quarter of an hour the figure of a guardian angel appears on the left side of the principal field. The striking of the quarters is done by two angels standing in the recess on the left, while in the sixth recess two figures at a time, representing the four ages of man, are changing alternately. On the right side of the principal field the Angel of Death advances, pointing with his scythe to the dial plate. When the full hour strikes, the center angel of the second recess appears holding an hour glass, while the angel on the right side above is sounding a trumpet. Under the roof an allegorical figure represents symbolically the right season of the year, while above in the principal field the guiding star of the year appears. On the left side of the clock cabinet stands a cock, which five minutes before noon beats its wings, stoops its neck, opens its bill and crows three times.

When the picture shows "Spring," there appears a cuckoo above; "Summer" is represented by a quail, which issues forth on the left side, both calling seven times. A bull lying at the feet of St. Luke the Evangelist roars to symbolize "Autumn," and "Winter" is indicated by a lion lying close to St. Mark. Every time the clock strikes twelve, Christ, bending his head, appears with his twelve Apostles, and a monk standing in the portal above rings his "Ave."

The clock contains a small chime which plays for five minutes after the striking of an even hour, the melodies changing and each lasting one minute. The work has twelve little bells, and on the roller there are 997 pins, which make the music.

A New African Railway.

A dispatch to The London Times from Brussels says the decision of the Government of the Congo Free State to construct 1,000 kilometers (621 miles) of railway in the Upper Congo region marks an important stage in the development of the colony. The railway will bring the thickly populated banks of Lakes Albert and Tanganyika into direct communication with the Congo River, through a country exceptionally rich and capable of rapid development. The new line, unlike the Lower Congo Railway, will remain the permanent property of the Congo Free State.

The Shell Line, Limited, an English corporation, have eighteen of their vessels fitted to burn both oil fuel and coal; the change from one to the other in case of necessity being made in thirty minutes, the engines not being entirely stopped during the change.

Brief Notes Concerning Patents.

William B. Green, of Metropolis, Ill., claims to have refused an offer of $150,000 for a filter which he has recently patented.

Andrew Darius Huff, one of the pioneers of Denver, Col., and the inventor of one of the earliest forms of the revolving turret, died recently at his home in Denver.

Three patents were recently issued to Cornelius Vanderbilt in one week. Two of them are for railway appliances and the other for the machinery for making one of the new devices.

The English patent rights of the Acme Machine Screw Company, of Hartford, have been recently disposed of to the firm of P. F. Pease & Co., of London. The amount received was $40,000.

A company has been recently formed with a capital of $100,000 to make use of the tin-plate manufacturing method which is the invention of T. V. Allis of Bridgeport, Conn. It is claimed that the cost of making tin-plate is reduced by 30 per cent by the Allis patents, and the manufacture will be begun at once in this country and England.

Josiah M. Read, of Everett, Mass., said to have invented the first cooking range in 1846, died at his home in that city, aged ninety-two. He had been an invalid for several years. Death resulted from old age. In 1839 he came to Boston and began the manufacture of stoves on Blackstone Street, where he remained until 1888, when he retired from business at the age of eighty years.

Counsel for James P. Witherow, who has an infringement suit for damages amounting to between $40,000,000 and $50,000,000 against the Carnegie Company, has filed an appeal in the United States Circuit Court of Appeals. It is claimed that a saving of one dollar was made on every ton of blast metal used in the manufacture of Bessemer steel since 1888 by the use of the alleged infringement.

Charles E. Munroe has been designated by the Royal Academy of Sciences at Stockholm to nominate the American inventors and discoverers in the science of chemistry who may desire to compete in the annual distribution of prizes which is made under the will of the late Alfred Nobel. Prof. Munroe is the dean of the Columbian University. Other Americans will be named to fill similar offices in other branches of science.

Daniel Drawbaugh, whose name is connected with the early telephone work and subsequent litigation, has perfected a system of wireless telegraphy which is said to have many novel features, particularly its simplicity and ease of manipulation. He has succeeded in getting a number of people interested and a company will be formed to push it at an early date. A demonstration was given a few days ago at Eberly's Mills, near Harrisburg, Pa.

Charles E. Hopkins, of the Worcester Spy, has perfected a machine for casting plates for use on newspaper presses which he began working on in 1892, when he was employed on the Wilkesbarre Record. By this appliance it is possible to turn out duplicate plates at the rate of six a minute, and the plates are almost ready for the press. This improvement represents a great economy of time, which is quite an important consideration in the large newspaper offices.

The cable reports great activity in airship construction since the achievement of M. Santos-Dumont recently. M. Bouchet, who was the builder of the Dumont airship, has received orders from M. Roze, Baron Bradsky, M. Lisboa, Ambassador at St. Petersburg, and M. Severe, a Brazilian Deputy. M. Deutsch has been recently summoned as the representative of the Aero Club, at the instance of a resident near the club house, who objects to the odor arising from the house where the hydrogen gas is manufactured.

The great pressed steel industry, which is now one of the most formidable in the world, was founded on an almost insignificant patent granted to Charles T. Schoen for a device to hold back the doors of railway cars. After this had been successfully introduced, Mr. Schoen cast about for a cheaper way of making them, and struck on the method of pressing them from steel. Freight cars are at present made entirely out of pressed steel, and the company has more orders than can be filled in three years at the present capacity of the works.

M. Goubet, the inventor of the French submarine boat, is endeavoring to adapt that style of craft to the Channel traffic between England and Europe, and has constructed a model of a boat designed for this particular purpose. This has been shown in working order to a number of persons whom he hopes to interest in the scheme. The craft is to be fastened to a cable and thus work its way back and forth at a uniform depth under the surface. The advantage claimed for this kind of a service is that the discomforts almost invariably experienced by the trip on the surface will be avoided.

Engineering Notes.

Certificates or licenses issued to marine engineers are graded according to class, first, second, and third, which refers wholly to the vessel they are entitled to take charge of, not to the man's qualifications. Many engineers in subordinate positions have chief engineer's licenses.

When the royal English yacht "Victoria and Albert" was put in service some years ago it was stated that she was very defective in design, rolling to such an extent that she was not only uncomfortable, but unsafe. Some changes were made in her which have made her entirely seaworthy; so much so that in very heavy weather she does not average over 11½ degrees each way.

Foreign technical journals state that the turbine steamer "King Edward" has shown an economy of twenty-five per cent in fuel over the paddle steamers in the same service, and makes better time. The German navy is to have a torpedo-boat destroyer with the same kind of engines. It is also stated that the British Admiralty will build another vessel upon the same lines as the "Cobra," lately wrecked, and equip it with turbine engines.

An Italian engineer, M. Triulzi, has devised a special instrument, the cleptoscope, whereby it is possible for the crew of a submarine boat to ascertain what is progressing on the surface while submerged. It comprises a tube fitted with crystal prisms in a special manner. Severe experiments were carried out with the apparatus on board the submarine "Il Delphino" in the presence of the Italian Minister of Marine. Photographs of objects on the surface were successfully obtained.

Remarkable developments have been made in the construction of the two latest submarine vessels, "Triton" and "Espadon," for the French navy. They are of the Narval type, but M. Labeuf, the eminent naval engineer, has introduced several important improvements. In their trials these two boats attained a speed of ten miles an hour in a forty-mile run, a hitherto unprecedented speed. A new arrangement for the supply of air, devised by Dr. Gibiat, has also been requisitioned, and by this means the "Espadon" was able to remain submerged to a depth of 50 feet for four hours without the crew experiencing the slightest ill effects.

In view of the success that has attended the pneumatic signaling on the London and South-Western Railroad in England, the North-Eastern Railroad have adopted a similar system at Tyne Dock. If the old style of mechanical locking by means of levers, cranks, wires and rods had been adopted in this instance, 250 levers would have been necessary to control the signals, etc., of this special yard, but by the electro-pneumatic signaling plant only 106 are requisite. The Westinghouse Company are carrying out the installation, which will consist of two frames, one containing seventy-one, and the other thirty-five levers. The Lancashire and Yorkshire Railroad are also adopting the same system at Bolton, Lancashire, one of their busiest stations, and it will be extended throughout the whole country within a short time.

Some useful, practical instruction is given concerning superheated steam in a paper read at the International Engineering Congress at Glasgow recently. It appears that the difficulties with it begin with the construction of the engine itself, and that existing engines are unsuited to it. The great heat, 700 degrees usually for the best economy, distorts the cylinder walls and the valves, so that allowances must be made for this heat by the use of liners arranged in a certain way. Two valves, one working inside the other, as in some expansion engines, cannot be used, and even slide-valves must be kept of as small areas as possible. Corliss valves will not work under superheated steam, and no form of packing, such as rings and springs, in piston-valves, will answer. Poppet-valves under certain forms of construction do well, but it very often happens on starting that the valve-stems get hot sooner than the bonnets, and expanding in them stick fast, unless unusual clearances are provided. Stuffing boxes do not give any trouble if they are made so as to project much more than is usual from the cylinder head, and the clearance in the bush at the head is made large, but no metals which melt under the temperature of the steam can be used for packing. The best valves are of the piston type ground in. Boiler pressures above 160 pounds should not be used, as no economy results from greater pressures, and, as less heat is lost by transmission to the cylinder walls by superheated than with saturated steam, the whole range of expansion can be carried in one cylinder, instead of two or more. It is asserted by the author of the paper that the use of triple expansion engines has no effect whatever upon the economy. Ordinary high-pressure non-condensing engines, which required 25 to 30 pounds of water with saturated steam, will deliver a horse power for half that quantity with superheated steam.

Science Notes.

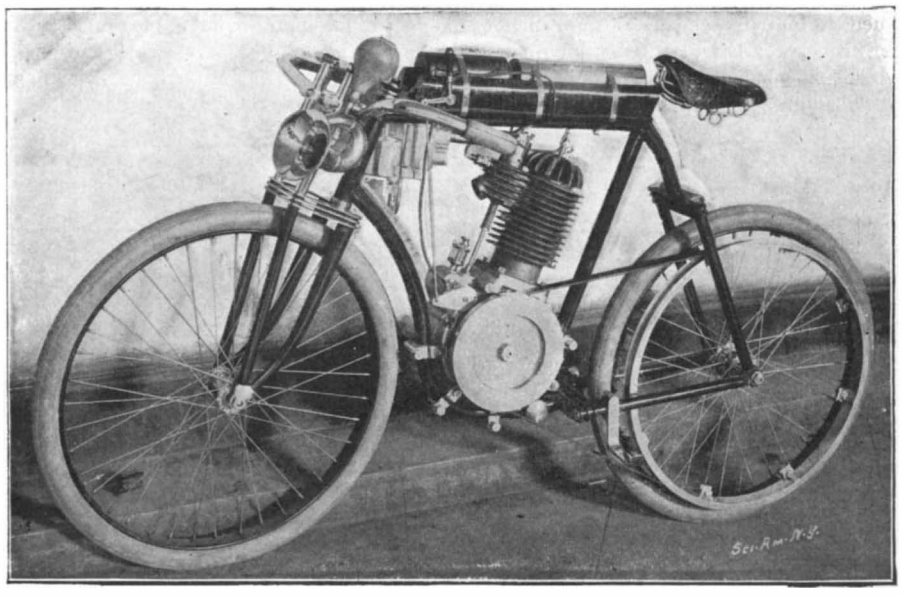
Lisbon has been suffering from a pest of rats, for which the general antidote of cats, traps and poison proved abortive. As a last resource bacilli were employed, and the municipal doctors were commissioned to inoculate some rats with an infectious disease. A suitable virus, harmless to man, was found, a few rats captured and inoculated, and then released. The experiment proved a great success, for the bacillus rapidly spread and the rats died with wonderful rapidity, so that in a very short time the city was freed from the rodents. It is now proposed to clear vessels from rats in the same way.

A striking discovery has been made during excavations which were necessary to raise one of the monoliths in the famous prehistoric group at Stonehenge, in Wiltshire, into an upright position, says the New York Sun. The men engaged in the work have found numerous neolithic implements, which had evidently been used in cutting and squaring the stones, and, when blunted, had been turned into the bedding on which the stones are supported. The discovery is held to prove that the unique spectacle of Stonehenge is anterior to the Bronze age and that the structure still visible was certainly built before 1500 B. C.

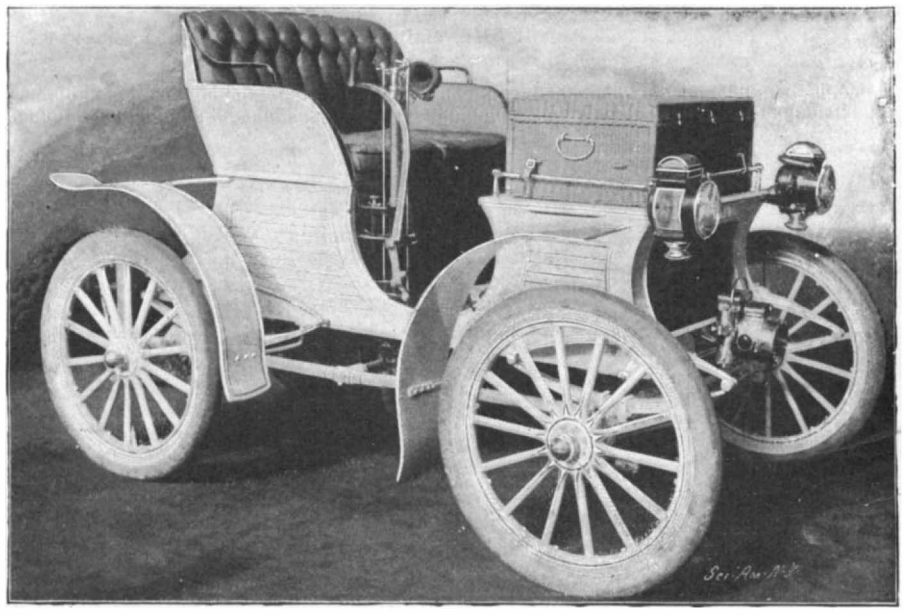
Consul-General Hughes reports from Coburg, September 24, 1901, that, according to the German press, the wool from the neighborhood of Bagdad is considered the best in Arabia; the next is from the region around Mosul, and then from Kurdistan. Wool is the most important export from Mesopotamia, and its chief point of shipment is Bagdad. Bassorah exported, in 1899, 37,650 bales of wool, of a value of 6,024,000 francs ($1,162,632), as against 38,000 bales in 1898. All of this went to Great Britain, France, and the United States. Not one modern factory for woolen goods exists in Arabia, in spite of its large quantities of the raw material; the only use of the wool is the making of abas (a large outer garment) by hand.

Discussion of the metric system occupied the attention of the International Engineering Congress recently at Glasgow, and Mr. Arthur Greenwood was of the opinion that it would, in time, become universal. This is not a new forecast; we do not know how many years have elapsed since it was first pronounced, but the progress made does not seem to be encouraging, for about as many arguments can be adduced against the change as can be set up in its favor. Mr. Greenwood said that the most serious obstacle to the general use of the metric system was the fact that all small tools, drills, reamers, gages, etc., would have to be abandoned and new ones made, but he thought this could be easily done. This depends greatly upon the point of view—and several other things. It would not be impossible to abandon the present system if all were agreed upon its necessity, but there are many opinions as to that, and while establishments with large capital and prosperous businesses could afford to throw out thousands of dollars' worth of tools, there are many others to whom it would be a serious loss.

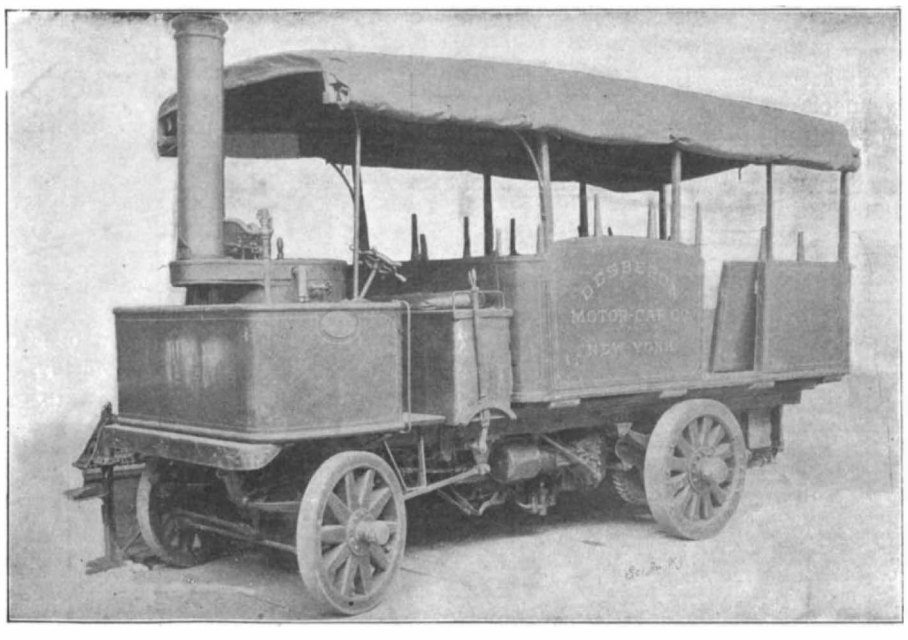
Major Austin has recently returned from his exploration tour in the north of Abyssinia, after experiencing great hardships. The result of the expedition has been the mapping out of the region between the Nasser and Murle, a district on the Oto River north of Lake Rudolph. By this achievement the whole region between Khartoum and latitude 16 deg. 11 min. north and between 33 deg. and 36 deg. longitude is mapped out. Major Austin found that although the region for the most part consisted of deserts and mountainous country, there were areas which could be utilized for cultivation. One peak north of Lake Rudolph he found was 7,000 feet high. The expedition encountered storms of almost unparalleled severity. The heavy rains either quickly entered the sandy soil or formed into foaming rivulets. The principal river, the Oto, flows into Lake Rudolph. This lake has no outlet, and its water is quite undrinkable. The maximum temperature of the region was found to be 107 deg. with a minimum of 68 deg. Two new species of antelope were discovered, but the party was compelled to abandon its zoological and other curiosities, owing to the exigencies of reducing the transport, the death of the black porters accompanying the expedition, and the hostile nature of the natives. The latter proved to be of a very low type, very warlike, and uninteresting. The Turkana tribe inhabiting the country west and south of Lake Rudolph were the most troublesome. They own large flocks, upon which they subsist, eating practically no grain. This tribe attacked Major Austin's camp on one occasion, but were repelled with heavy loss. The mortality among the members of the expedition was very high. Thirty-two black porters set out with the party, but only two returned. Half the Soudanese escort was also lost, the deaths being due to starvation and exhaustion. Nine of the party were killed by the hostile Turkanas. The expedition suffered awful privations. Food was scarce and for two and a half months they subsisted on the flesh of their donkeys and camels, and suffered terribly from scurvy.



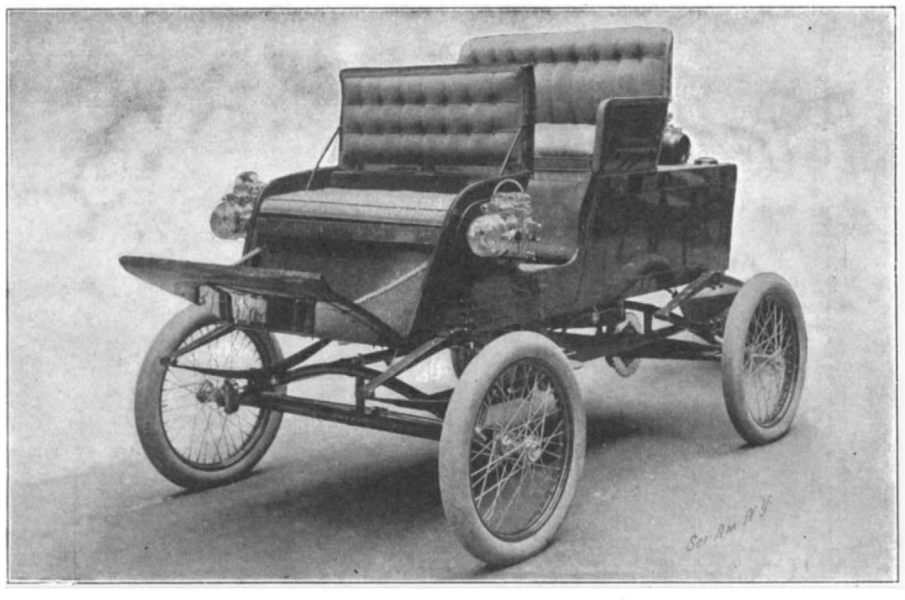
6-Horse Power Marsh Racing Motor Cycle. Mile in 1 M. 2 3-5 S.



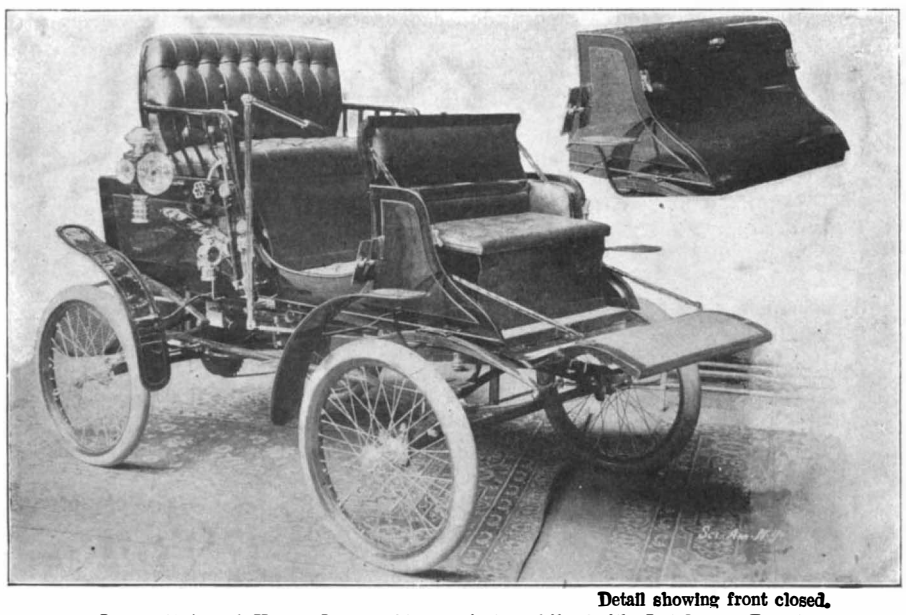
12-Horse Power Searchmont Touring Car.



25-Horse Power Desberon Steam Lorry. Weight, 4 1-2 Tons. Load, 4 1-2 Tons.

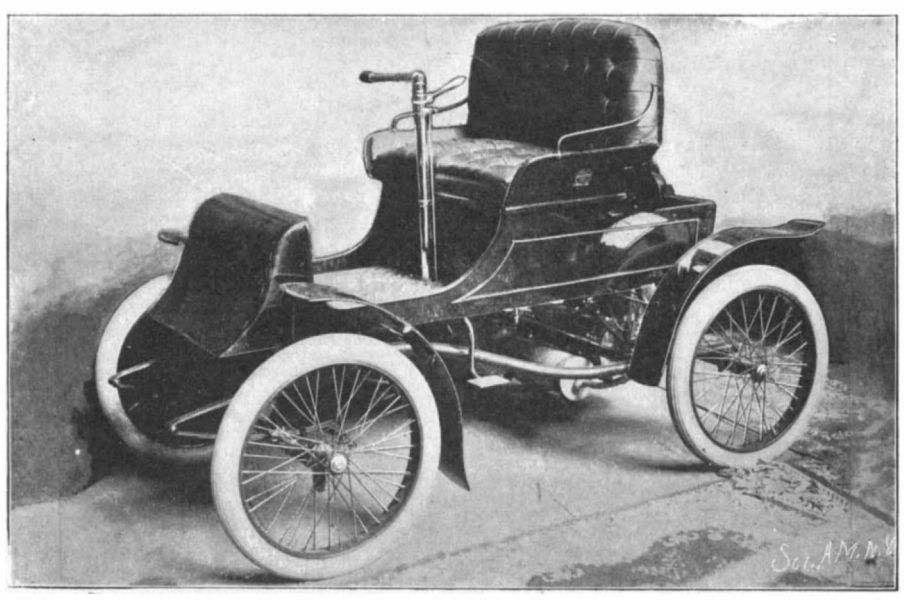


Locomobile Touring Model B With Let-Down Front.

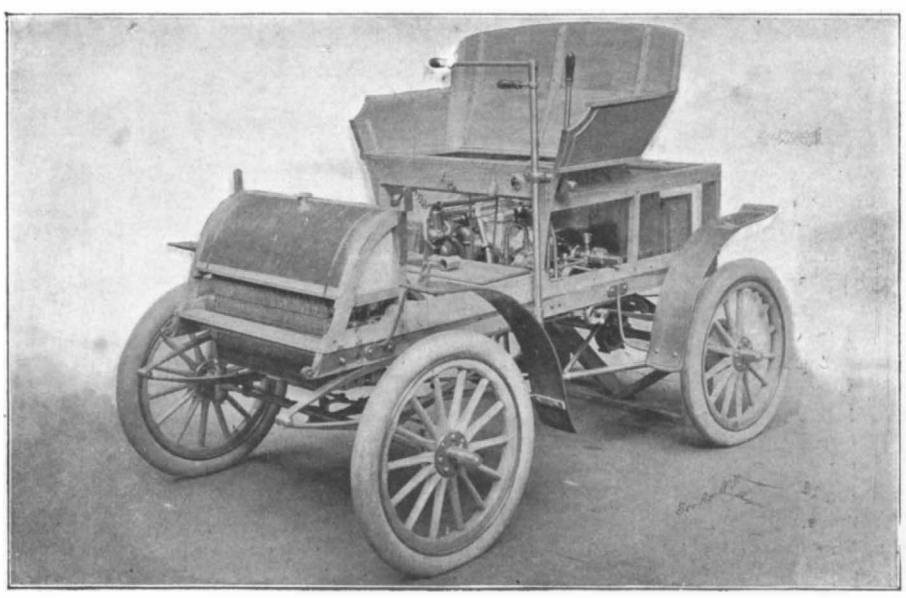


Detail showing front closed.

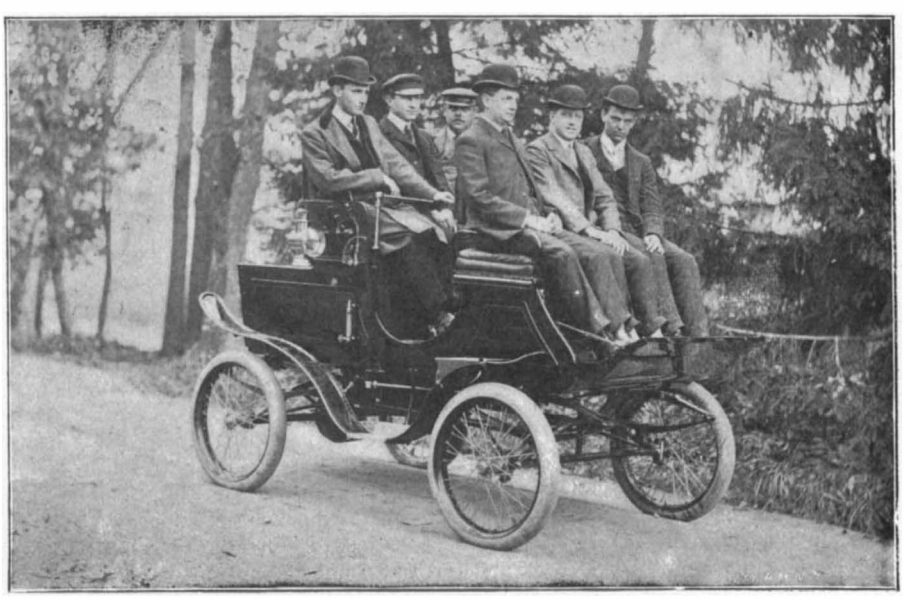
Prescott 7 1-4 Horse Power Steam Automobile With Let-Down Front.



Pierce 2 3-4-Horse Power Motorette. Weight, 500 Pounds.



8 1-2-Horse Power Autocar. Skeleton View.



Mobile Touring Carriage for Six Persons.

SOME EXHIBITS AT THE AUTOMOBILE SHOW.—II.

THE LICK OBSERVATORY-CROCKER ECLIPSE EXPEDITION TO SUMATRA.

It gives me great pleasure to announce that the expedition sent to Sumatra from the Lick Observatory through the generosity of Mr. William H. Crocker, to observe the total solar eclipse of May 18, was very successful. This announcement has been unduly delayed from the fact that the scientific apparatus and the astronomical photographs containing the results were sidetracked at an Asiatic port for three months, and have but recently arrived at Mount Hamilton. The expedition was in charge of Acting Astronomer C. D. Perrine. He was assisted by Mr. Ralph H. Curtiss, Fellow in Astronomy at the Lick Observatory.

A site for the observing station was selected on the race-course in the edge of the city of Padang, the capital of Sumatra, located at about the middle of the west coast of the island. The accompanying illustration will give an idea of the immediate surroundings of the camp. The great thatched tower supports and incloses the camera of 40 feet focal length for recording details of the solar corona on a large scale. This instrument was designed and first used by Prof. Schaeberle in the Chile expedition of 1893, and was the original of the long-focus instrument now so largely adopted by nearly all eclipse parties. The lens is at the top of the tower, and the plate holder, moving by clockwork, is at the bottom. The lens is supported by an inner tower, and the outer tower, completely isolated from the inner, serves both to prevent the wind from shaking the lens and to keep out the tropical rains.

The nine other instruments are located in the smaller thatched huts.

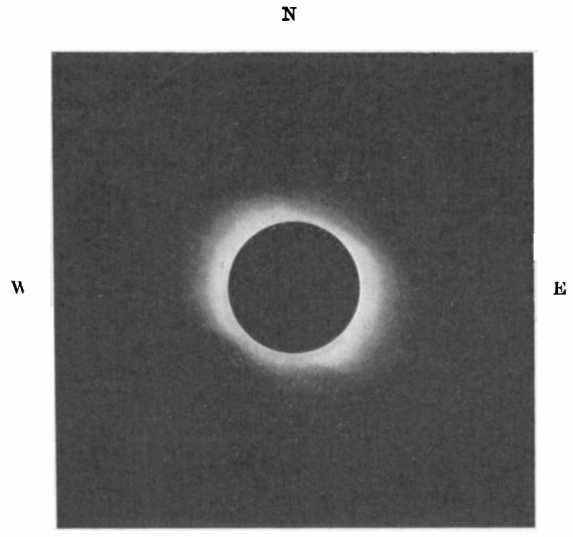
The ten instruments were mounted and in perfect adjustment a week before the day of the eclipse. The remaining days were utilized by Prof. Perrine in training his sixteen assistants, secured in Padang, so that they could take the photographs in strict accordance with the signals previously arranged, and in attending to the multitude of final details.

The morning of the eclipse dawned cloudy, and the clouds persisted until the middle of the afternoon. At the time of the eclipse, which occurred a few minutes after noon, the clouds were comparatively thin; and Prof. Perrine's cable home did not afford much hope that useful results had been secured. The negatives were developed in the week following, and a cable dispatch conveyed the very welcome news that useful results had been secured with all the instruments. The photographs have reached home in perfect condition, and a careful examination here confirms the contents of the cablegram.

The negatives secured with the 40-foot and the smaller cameras show the inner corona as well, probably, as if there had been no clouds to interfere; but the longest recorded streamers are limited to about one and one-third solar diameters. The photographs are full of interesting details, some of their features being unique. They will be very valuable in studies looking to an explanation of the origin of the solar corona.

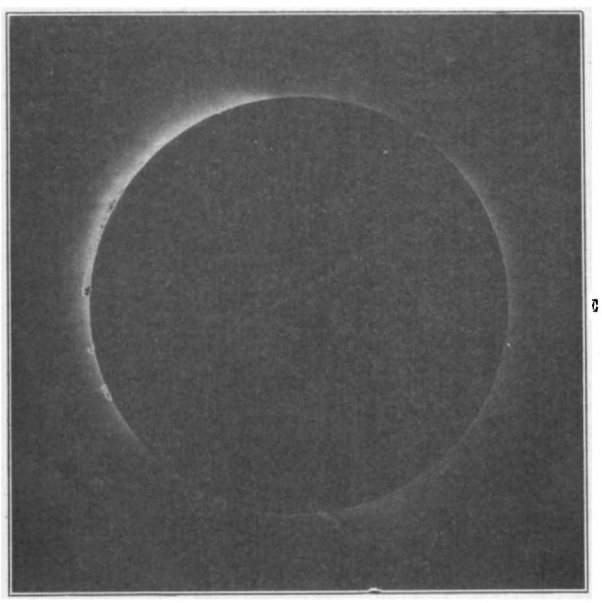
Four cameras of 11 feet focal length were used in making an examination for a possible planet nearer the sun than the planet Mercury. Photographs of the portion of the sky to be occupied by the eclipsed sun were obtained on Mount Hamilton the night before the apparatus was shipped to Sumatra. Photographs of this same region of the sky were secured at the time of the eclipse. During the first half of totality, when the clouds were thin, the negatives show stars down to nearly the ninth magnitude; but during the latter half of the eclipse, with thicker clouds, no stars were recorded. For about half the area to be examined the results were, therefore, very satisfactory; but for the other half nothing was secured. A comparison of the photographs made here and in Sumatra should lead to the detection of any unknown bodies.

The photographic results from the polarigraph and the two spectrographs were better by virtue of the clouds than they would have been with a clear sky. In new work of this kind there is very little to guide the observer in forming his estimate of the length of exposure required. In this case it has happened that the reduced brightness of the sky gave proper density to the negatives, whereas with a perfectly clear sky the photographs would have been over-exposed, and some of the desired results thereby lost. These fields of work are



PHOTOGRAPH OF CORONA WITH FLOYD TELESCOPE.

highly technical in their nature; but it will interest many to learn that the outer part of the corona shows a large percentage of polarized light, whereas the light of the inner corona is polarized much less strongly. The conclusion to be drawn from these



PROMINENCES AND EXTREME INNER CORONA FROM NEGATIVE SECURED WITH 40-FOOT TELESCOPE.

results is, that the light from the outer corona is largely reflected or diffused sunlight, whereas that from the inner corona originates from the incandescent corona itself.

The spectrum of the outer corona as recorded on the photographs appears to be identical with the solar spectrum, whereas the spectrum of the inner corona is entirely different in that it shows no trace of dark lines. The conclusion to be drawn from these extremely valuable results is precisely the conclusion drawn from the polarigraphic results.

The general conclusion to be drawn from the many valuable results obtained by the expedition is, that the coronal structure surrounding the sun is made up of matter, probably very finely divided, ejected from the surface of the sun with great velocities, just as we have matter ejected now and then from terrestrial volcanoes with comparatively small velocities. This conclusion is entirely in accord with that reached by Prof. Schaeberle in 1893 from a different train of reasoning, and from an entirely distinct set of facts.

Illustrations herewith show the details of the extreme inner corona as secured by a short exposure with the 40-foot camera; and of the different features of the corona as photographed with the Floyd camera of 70-inch focus. W. W. CAMPBELL, *Director*.

Mount Hamilton, November 2, 1901.

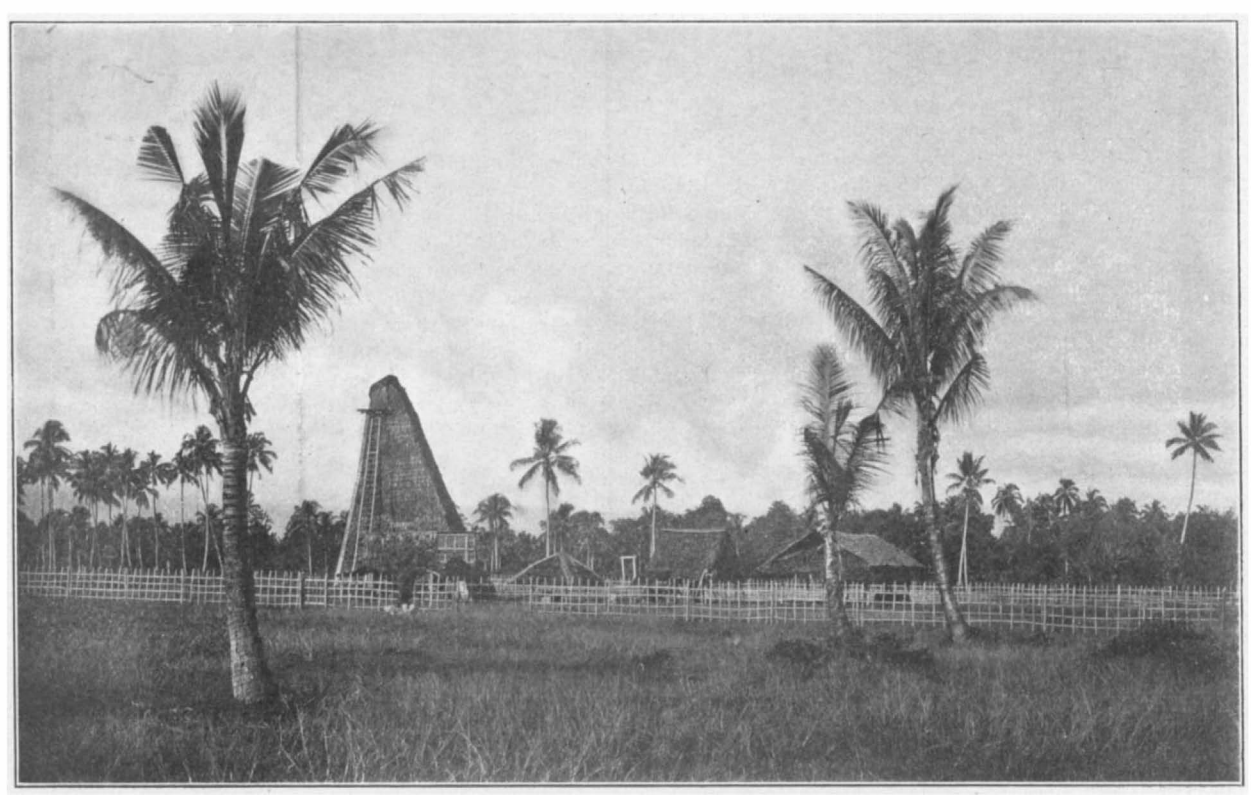
SOME EXHIBITS AT THE AUTOMOBILE SHOW.—II.

Continuing our notice of this year's most excellent exhibit at Madison Square Garden, we draw attention to the fact that if these annual displays are a correct indication of the year-by-year advance made in the industry, the past twelve months must be conceded to be by far the most progressive and interesting in the history of the automobile in this country. In our previous notice of the Show we referred to the fact that the freak machine was conspicuous by its absence—a gratifying fact in itself, and doubly so when we remember that the fine assemblage of machines on exhibit was marked by really extraordinary improvement in every respect, and in none more so than in the general contour and finish. For simplicity, grace and harmonious proportion of parts we think the time will soon come, if it is not already here, when the American-made automobile will be pronounced the handsomest on the market.

Although not many motocycles were shown, those on exhibition appeared to be serviceable machines. The recently-completed 6-horse power Marsh motorcycle for pacing purposes cut quite a figure at the Show on account of a sign in front of it declaring it capable of 60 miles an hour. As a matter of fact, the machine has made a trial mile in 1 minute 2 3-5 seconds on a State roadway near Brockton, Mass., and we presume that the sign was intended to make it known that a speed of a mile in one minute or a rate of 60 miles an hour was expected. If the machine accomplishes a mile in one minute the feat will not be surprising in view of the great power of the motor. The lines and unusually rigid construction of the wheel are sure to make it a favorite with those who wish to emulate the speed of the swiftest of high-power automobiles.

A rather showy machine of compact appearance was the Searchmont touring car, designed for long and continuous runs. The framework, especially heavy, is provided with a flexible joint to accommodate inequalities of the roadway. The car is driven by a 12-horse power, double-cylinder motor, and has two speeds ahead and one reverse. The wheels are 32 inches in diameter, and the wheel base measures 5 feet 6 inches. It is furnished with a touring basket in front, for which, if desired, a cushion may be substituted providing an extra seat. The approximate weight is 1,800 pounds.

Among the more massive machines in the exhibition was the Desberon steam lorry, which is constructed on the lines of the Thornycroft steam lorry, but with improvements and modifications introduced by the present builders. The boiler, which is located at the front, is of the water-tube type. The engine, which is of 25 to 30 horse power, is geared for two speeds, and the truck, which weighs 4½ tons, has a capacity of 4½ tons of freight, making a total weight of 9 tons. The construction is simple and, of course, massive, as may be judged from the fact that the wheels have a tread of 6 inches, and the steel tires are 1 inch in thickness. It may be mentioned as an item of



LICK OBSERVATORY-CROCKER ECLIPSE STATION, PADANG, SUMATRA.

interest that when the company's shop was moved from New Rochelle to New York the whole of the plant was transported on the lorry shown at the exhibition. On the same stand was a light voiturette driven by a 4-horse power, gasoline, air-cooled motor, with a water-cooled head.

Some of the makers this year showed an excellent arrangement of the front end of the body, in which the seating capacity can be doubled by a simple operation. One of these is the model No. 1, Prescott steam automobile, of which we present two illustrations, one showing the front end of the body, corresponding to the dashboard of a horse-drawn vehicle, closed, and the other open. The casing is hinged, one-half of it containing the back rest and the other half forming the foot rest. When these are thrown back and down a cushioned seat is drawn forward, thus providing a thoroughly comfortable extra accommodation for two persons. This machine has been built in response to the demand for a heavier construction than is afforded by the ordinary steam runabout or Stanhope type. The wheel base has been extended and measures 5 feet. The water tank has a capacity of 32 gallons and the fuel tank of 12 gallons. The boiler measures 16 by 13 inches, and is provided with a superheater and a 16-inch two-piece burner. A feature in the design of the 7¼ horse power engines is that the bearings are all plain and of exceptional width. The running pressure of the boiler is 200 pounds to the square inch. This machine, whether with the front let down or closed, presents a very neat, attractive and well-balanced appearance. Its weight with the tanks filled is 1,050 pounds.

Another automobile of the let-down type that attracted much attention was the locomobile touring Model B. This has a seating capacity for four passengers, a 73-inch wheel base, a capacity for 21 gallons in the fuel tank, 49 gallons in the water tank, while the boiler and engine are of large capacity, the diameter of the boiler being 20 inches. The latter is of the upright fire-tube type, and is composed largely of copper. The running pressure is about 180 pounds. Some changes which will be appreciated have been made in the burner, the top plate being constructed in one piece, while an excellent shut-valve permits the fire to be turned off without the operator having to get out of the carriage. In this year's type the differential gear has changed from bevel gears to spur gears, and the device is completely inclosed and runs in grease, the spur gears being keyed instead of pinned to the axle. The locomobile also used a double-acting brake which arrests the backward as well as the forward motion of the carriage.

Particular interest attaches to the Pierce motorette knockabout, a shapely little car which has the distinction of being the smallest vehicle that took part in the endurance run from New York to Buffalo. Two of these little fellows were entered, and although they are only provided with a 2¾-horse power De Dion motor, they climbed all the hills without assistance. This is not only the smallest-powered, but also considerably the lightest machine that took part in the run, since its weight is but a little over 500 pounds when in ordinary running order. Sufficient gasoline is carried for a run of over 100 miles, and from 30 to 35 miles can be run on one gallon of gasoline, the distance, of course, being dependent upon the condition of the roads and weather. The motorette is capable of a speed of 20 miles, while from 10 to 14 miles an hour can be maintained over ordinary roads.

In our last issue we showed an autocar complete, ready for service, and we now present a view of the same car with enough of the framework removed to show the running and driving gear. The running frame is of one-inch tubing, and stoutly trussed. The lower frame is of hickory and the body frame of oak. The tank of cooling water will be noticed behind the seat, while six gallons of gasoline are carried beneath the forward hood. The double-cylinder gasoline motor is seen below the seat, and the illustrations show well the compact arrangement of the driving mechanism.

The steam-driven Surrey exhibited by the Lane Motor Vehicle Company, weight 1,325 pounds, is a machine of substantial build and pleasing appearance. It has 34-inch wheels, 3-inch tires and an 8-foot wheel base. There is fuel capacity for from 40 to 50 miles over ordinary roads, and the air pressure is pumped direct by the engine. Devices are provided for the absolute protection against a dangerously high water level, while a low-water alarm is also supplied. As the exhaust is direct to the water tank there is a saving of a considerable percentage of the water, and a return of heat to the boiler.

The Stearns Steam Carriage Company have taken a decided step in the direction of the perfect steam carriage by introducing a compound engine with water pump and air pump attached to the crossheads. The radius of action of the steam carriage to-day is limited by the water supply, and any devices that will reduce water consumption will be welcomed. There is no reason why the compound system, even in such a small size as this, in which the cylinders are 2 inches and 3 inches by 3½ inches stroke, should not show its usual economy over the simple engine, and the makers claim a saving of 20 per cent in fuel and water. The engine, which is completely incased, was one of the most attractive pieces of mechanical work in the Show. A feature of great value for touring is that by means of a distributing valve the engine can be turned at once into a simple engine, thus greatly increasing the power of hill-climbing. If the Stearns Company will follow to its logical conclusion the line upon which they are working we shall yet see their carriages fitted with a condenser—a device which would bring the radius of steam carriages up to that of any type of automobile extant.

Among the Stearns carriages there was none of more pleasing appearance than Model B, a trap or dos-a-dos carrying four persons, back to back. It has a let-down back and footboard, by closing which it may be turned into a single-seated vehicle having the trim appearance of a runabout.

A decidedly attractive vehicle was the Knoxmobile, a particularly easy-riding car, whose comfort is due to the introduction of the old side-bar spring with pivot connections at the end of the springs to the axles. The 7-horse power engine is cooled by air, the draft being intensified by a small fan. The exterior of the engine is entirely covered by 3,000 3-16-inch pins. Ten gallons of gasoline giving a capacity of 250 miles are carried. The engine is horizontal, single-cylinder, and three brakes are provided which hold the vehicle in either direction.

The Century Motor Vehicle Company are makers of a steam carriage which is the only one that makes use of a bevel drive. This is incased and is dust-proof, and a set of gears was exhibited which showed an excellent state of preservation after several thousand miles of service.

The new mobile touring carriage, shown for the first time at the Madison Square Garden exhibition, had just returned from a 250-mile run between New York and Washington, in which the 100 miles from New York to Philadelphia was covered in eight and a half hours of night riding. The machine has been built with a special view to strength, and a successful effort has been made to get rid of some of the objectionable features of European machines. It has sufficient power to climb the heaviest grades and sufficient gasoline is carried for a run of from 125 to 225 miles, according to the difficulty of the road. Particular attention has been paid to those features which experience with steam-driven vehicles has shown to require special attention, and during the New York city and Washington run referred to, we are informed that the operations of pumping air and water, oiling, etc., were conducted while the machine was running and without interruption. Water was renewed at intervals of from 25 to 35 miles. A notable change has been made by getting rid of the by-pass and rendering the regulation of water in the boiler purely automatic. Another notable carriage shown was a 12-passenger vehicle, a dozen of which type have been in operation during the past six months in New York city. In spite of its large capacity this wagon weighs but 1,900 pounds. It has been built to do work of an omnibus character, but with greater speed and regularity than usually characterize that class of vehicles.

The Packard machine, exhibited by the Ohio Automobile Company, attracted considerable attention from the fact that out of five entries of these machines in the Buffalo endurance run, four received first-class certificates, and one a second-class certificate. The makers claim that their very handsome models are not in any sense a mere copy of other existing vehicles. Model C, the original machine made by the company, and Model F, were both on exhibition. The first-named is a horizontal single-cylinder, four-cycle engine of 12 horse power. Connection is made with a clutch and gear shaft, by a spring transmission. The jump-spark ignition is used, two sets of dry batteries with a double-throw switch being provided. The gasoline tank holds sufficient fuel for a 150 to 200-mile trip, according to the roads, and the working speed varies from 7 to 22 miles. In Model F the essential features of Model C are retained; there are three direct-geared speeds ahead and one reverse, and both lever and pedal clutch control are fitted.

Limitations of space prevent any further reference to this most successful exhibition, in which the quality of the exhibits, almost without exception, was of such a high standard as to cause the opening year of the century to remain always the real starting point in the history of the thoroughly successful inauguration of the practical automobile in this country.

A Tropical School for Medicine in London.

A determined attempt is being made to establish a large Tropical School for Medicine in London, replete with every modern convenience and up-to-date appliances. The exigences of the colonial expansion of commerce in the tropics, especially of those dependencies infested with malaria, demand the foundation of such an institution. For this purpose no less than $500,000 are required. Many wealthy gentlemen, who have great interests in the tropics, are lending their strong financial assistance to the scheme. The Right Hon. Joseph Chamberlain, the British Colonial Secretary, has always evinced a strong interest in the matter, since the development of many of the British African colonies depends upon the successful subjugation of the various malarial maladies indigenous to these climes. The present school is wretchedly inadequate to fulfill the necessary requirements, since it has only six rooms available for the accommodation of students. The large mercantile companies are always demanding competent men, and these cannot be provided owing to deficiency of means. It is desired to erect a large building with more living rooms for students, enlarged laboratories, museum, and a library. Dr. Patrick Manson, the medical adviser to the Colonial Office, opines that in the course of one generation the blood of the Barbadians can be entirely freed from elephantiasis and cognate diseases. Sir Francis Lovell, who is also deeply interested in the scheme, proposes visiting India, Burma, Ceylon, Straits Settlements, China, Japan, New Zealand, Australia, Canada and this country, in order to emphasize the objects of the school and to obtain assistance, since it will be of universal importance and benefit. An expedition is at present being organized to visit Christmas Island, to investigate beri-beri and to study the pathology of other diseases. They will remain on the island for two years.

THE OPOSSUM.

BY A. C. CARSON.

The American opossum, representing the genus *Didelphys*, is one of the most curious animals in the United States. It is the only one carrying its young in a pouch or marsupium, like a kangaroo. It is the only animal which can feign death perfectly in order to escape its enemies, and the expression "playing 'possum" is a well-known phrase. It is also remarkable in that it hangs by its tail like a monkey. Its hands resemble those of a human being. It is most liberally provided with teeth, and has a snout like that of a hog, eyes like those of a rat, and hisses like a snake.

Mr. Edward Decker, an agriculturist residing near Columbus, Ohio, caught a female opossum last spring, and discovered that his captive had in her pouch an interesting family of twelve little ones. His dog had been investigating a rail-pile, and suddenly raised a tremendous outcry. Mr. Decker found the dog worrying the old opossum and delivered her from the jaws of death, but not until after she had been severely bitten. He dressed her wounds, took good care of her and succeeded in raising to maturity every one of the twelve young ones.

When first discovered, the baby opossums were about two inches long, hairless and sightless.

The dozen grew slowly at first, their progress being retarded by the injured condition of the mother. It was several weeks before the boldest of them, having had his eyes unsealed, timidly poked his white snout through the opening of the pouch and reconnoitered. By and by he ventured to crawl outside and hung by the long fur of the mother. Soon another and another followed the leader on a tour of inspection. After that the twelve came out daily, but were exceedingly timid, scuttling back into the pouch at the slightest noise or the approach of any person.

One of the twelve managed to escape from the old corncrib where they were confined and was gone for ten days. Upon his return he was immediately set upon by his brothers and sisters as a renegade, and had his large, fan-like ears bitten off close to his head.

The method of feeding the mother consisted at first of throwing in a pigeon, and later a fowl from the barnyard. The young opossums used to have fierce fights over their nocturnal meals, and in one of these wrangles one of their number lost her ear, after the style of punishment visited on the renegade. This seemed to be the vulnerable point of attack in a 'possum fight.

When they had attained the size of rats the young bore a remarkable resemblance to these rodents, and when all climbed upon their mother, clinging to her hair, neck and legs, she staggered under the load. No other mother among the animals of North America bears such a burden, and her patience and tranquillity under her manifold cares were admirable. The photographer who succeeded in taking the half dozen fine views of mother and family has given an insight into the domestic arrangements of the opossum family such as the world has never had; for the opossum, although far from uncommon in the United States, seems to be little understood. Owing to the nocturnal habits, comparatively few people have ever seen a female with her young.

The writer obtained from Mr. Decker four of the young opossums when they were about one-fourth grown, and he made a close study of their habits.

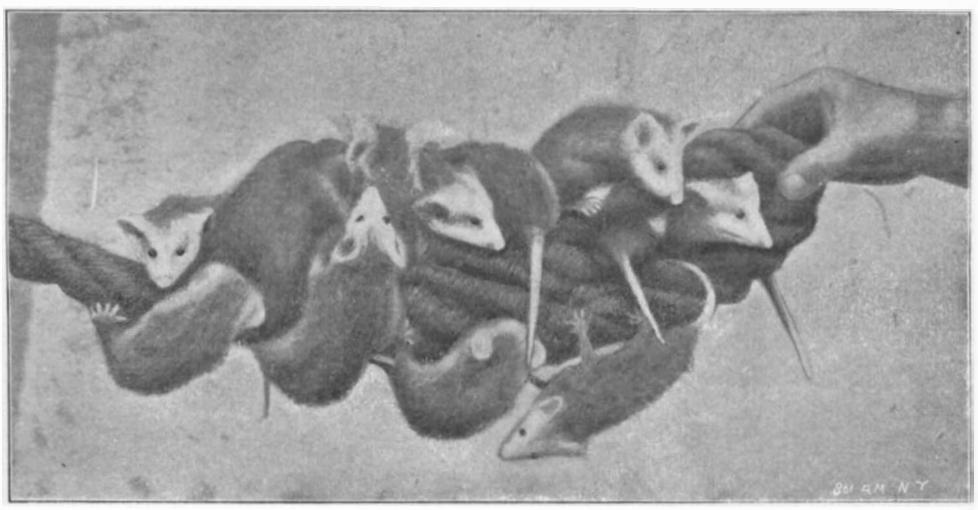
The opossum is known to naturalists as being one of the most innocent and harmless of animals. In its wild state, when attacked by man or dog, it immediately falls over as if dead, and no amount of beating or physical torture can make it cease "playing 'possum." There is only one way in which the animal can be made to resume the semblance of life, and that is by throwing it into water. A cold bath will instantly cause it to cease feigning death and swim for life.

In its habits this queer animal is a veritable sloth. The two things it likes best to do are to eat and sleep. It eats with great gusto and a carnivorous and omnivorous appetite. So eager were they to snap up a big beetle that one's fingers were in danger of being masticated along with the shelled tidbit. A half-grown frog tied with a string and dropped under their noses precipitated a vicious fight for possession. The contestants for the epicurean morsel growled and snarled like so many dogs, and chewed each others' noses and ears in reckless disregard of sensitive feelings and proprietary rights. The chaps whose noses were bitten hissed loudly, after the aspirate fashion of their kind.

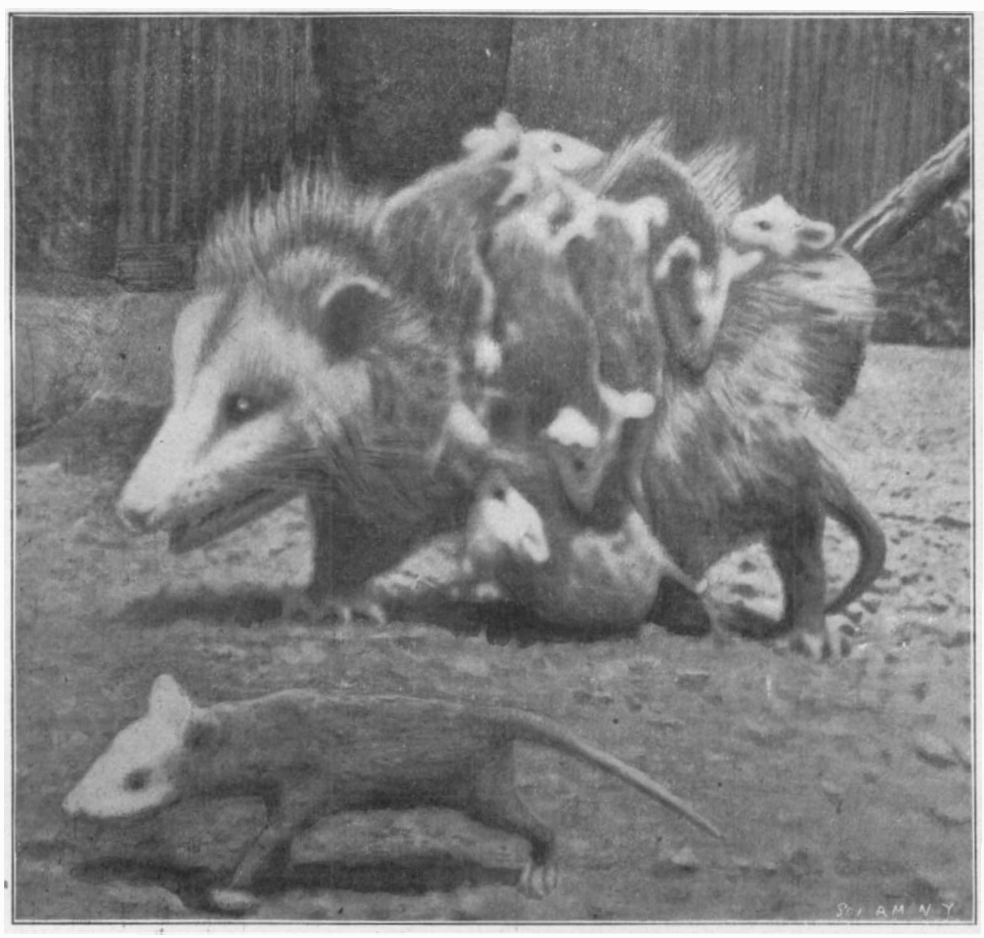
The four animals constituted two pairs. Three were gray, while one female was very dark. She was designated as "Blackie" and thrived amazingly, soon becoming larger than any two of the others. She was gentle but extremely sensitive and retiring. One day a collar and chain was put on her and she was taken for an outing in the fields. Blackie became possessed of a frantic desire to part company with her self-constituted guardian, and became furious at the restraint put upon her movements. At first she tried to get away by stealth, sneaking away slowly and softly through the grass, and, when at some distance, would begin to amble at a lively rate. Her disgust at being pulled up with a sudden jerk was pronounced, and she growled like a bear at bay, tearing at the chain with feet and jaws and ruffling her long hair till it stood like quills upon the fretful porcupine. She never got over the memory of that day, and always afterward slunk into a corner and crouched low to escape the hands reached forth to touch her. She never manifested any resentment, however, her only desire being to escape notice.

The young animals spent much of their time in combing their long hair and washing their faces and hands. For the latter purpose nature has supplied them plentifully with salivary glands, and in taking a bath Blackie and her companions used copious quantities of saliva. Their pedimanous extremities and their "fifth hand," the tail, were thus kept scrupulously neat, the hands being always clean and rosy. The hair-combing process is both interesting and amusing. Blackie performed this operation principally with her rear foot-hands. With the right one she would begin to comb just back of the ear, and continue until a point above the hips was reached. The work was finished with the front feet. The five fingers of the front extremity are supplied with narrow nails, as are also the four fingers of the hands in the rear, but the thumbs of the latter have no nails. In walking a limb the thumb invariably goes on one side while the four fingers go on the other. The tail, besides being handy in climbing and in suspension, is used while walking a limb, similarly to a rope-walker's balance-pole.

Young opossums may be carried around on the end of a walking-stick and make gentle and interesting pets. They possess none of the viciousness of that most diminutive of the bear species, the raccoon, but on the other hand seem to lack its intelligence. Naturalists characterize them as the most innocent and harmless of animals.



YOUNG OPOSSUMS ON A ROPE.



AN OPOSSUM FAMILY.

YOUTHFUL CLIMBERS.

Swedish Antarctic Expedition.

BY OUR LONDON CORRESPONDENT.

The Swedish South Polar Expedition recently sailed from Falmouth, England, for the Southern seas, where it will act in conjunction with the English and German Antarctic expeditions. The King of Sweden and the Swedish Geographical Society are supporting the enterprise. The vessel selected for the work is the "Antarctic," a small steamer of 390 tons. She carries a crew of twenty-nine all told, under the command of Capt. Larsen, who has had great experience in unfamiliar regions. The expedition is under the famous Swedish explorer, Dr. Otto Nordenskjold. There are two geologists, a botanist, and a meteorologist on board, besides the scientific members, while fifteen dogs and sleighs for inland exploration are being carried. The "Antarctic" proceeds direct to Buenos Ayres, and thence to the Falkland Islands. After remaining at the latter island for one day, the vessel will steam south to that section of the Antarctic known as the Weddel Quadrant, which will be the special sphere of operations. It will then proceed along the coast of King Oscar Land, and at the first suitable spot land the stores and the houses for the winter party, comprising Dr. Nordenskjold and five assistants. The ship with the remainder of the expedition will return to the Falkland Islands, where she will remain until the next Antarctic spring. In November or December, 1902, she will fetch the winter party. The principal work will be magnetic and meteorological observations. If opportunity offers, King Oscar Land will be mapped, and sledge journeys made into the interior. The expedition will be absent two years.

The Current Supplement.

The current SUPPLEMENT, No. 1351, contains many papers of unusual interest. "Count de la Vaulx Balloon 'Mediterranéen'" is by our special Paris correspondent, who visited Toulon for the purpose of interviewing the Count and obtaining photographs. "Enameling" is the third installment of a most important series. "Improvised Boosters" is by Walter M. Hollis. "Sewers of Ancient Rome" is an interesting article. "Prunes and Prune Culture in Western Europe" deals with a curious industry. "A New Method of Judging the Authorship of Handwriting" is by Dr. Persifor Frazer, and is accompanied by a number of most interesting illustrations.

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RECENTLY PATENTED INVENTIONS.

Agricultural Inventions.

PROCESS OF SPRAYING TREES.—Isaac M. Clark, Lompoc, Cal. The invention is a means of exterminating all kinds of insects—such as San José scale, Greedy scale, black scale, or any insect pest, microbe, or larva—that infest fruit or ornamental trees. The component substances of the spraying compound comprise kerosene oil or any mineral oil, caustic soda and water. The inventor has sent us a photograph which certainly speaks well for the efficiency of his process.

CHECK-ROW ATTACHMENT FOR PLANTERS.—Peter D. Andersen, Minden, Neb. Mr. Anderson has provided a check-row attachment, including a marker, that can be applied to any type of planter. The seed-drop slide is operated at intervals from one of the ground-wheels. The drop-slide-operating mechanism is thrown into or out of working contact with the ground-wheel by simple means. A lever is provided for the marker-shaft, so coupled thereto that the driver can at any time lower or raise the marker.

AGRICULTURAL IMPLEMENT.—James M. Waters, Forney, Tex. It has been the inventor's purpose to devise an attachment for planters, cultivators and the like, whereby the implement is enabled to yield to uneven ground, thus causing the plows or points to form rows of even depth from one end to the other. The attachment comprises a frame and a plow or point-supporting frame movable vertically with relation to the first-named frame. At the forward end of the movable frame a wheel is carried. The attachment has connection with the members of the movable frame, and sliding connection relatively to the upper frame.

Grain-Handling Apparatus.

MACHINE FOR CLEANING WHEAT.—Anton Leikem, Chicago, Ill. This simply-constructed machine is designed thoroughly to separate all foreign matter from wheat. The screens are so made and so disposed that the kernels of wheat are not injured during the process of separation. The material is subjected to the influence of a suction-fan, not only while it leaves the hopper, but also when cleaned. The air supply or degree of suction can be nicely regulated and likewise the inward discharge of foreign material from the machine.

STRAW-STACKER.—Adam J. Messer, Ashton, Ill. The straw-stacker is a pneumatic stacker, in which the straw is forced up a tube by pneumatic action. The invention provides means by which to prevent the blast from discharging the straw with such force as to throw it about and prevent its accurate delivery at any desired point.

Engineering Improvements.

RADIATOR.—George M. Aylsworth, Collingwood, Ont., Can. This radiator is particularly adapted for the heating of rooms by the radiation from hot air instead of steam or hot water as generally practised. The improved radiator has been devised with a view to simplicity and economy in construction, as well as efficiency in operation, and for use with hot air exclusively.

REVERSING-GEAR.—Richard F. Wilson, Albany, N. Y. The reversing-gear is to be used in connection with combustion-engines, or other engines or motors where the shaft is at all times rotated in one direction. The device is particularly adapted for the shafting of propellers for naphtha-launches. The gear comprises a driving-shaft and a reversing-shaft with bevel-gears loosely mounted on the shaft. An idler-gear meshes with the two bevel-gears. Clutch-blocks are movable on the two shafts and are designed to be engaged by clutch members on the bevel-gears, whereby the shafts are driven in opposite directions. The inner or adjacent ends of opposite clutch-blocks can be moved into engagement, whereby both shafts will be driven in the same direction.

VALVE AND VALVE-GEAR FOR ENGINES.—Frank J. Wilke, Little Rock, Ark. The invention relates to the form and operating gear of the valves for reciprocating steam-engines. The inventor employs a rocking valve, with which any release or flyback valve works to uncover and cover the exhaust. The valve is driven from a rocker provided with an adjustable part, controlled by the governor and to which the valve-rod is so connected as properly to control the steam.

ROTARY ENGINE.—Sirus E. Kochendarfer, Hollidaysburg, Pa. The engine is of that class in which the pistons are provided with sliding blades that operate within the cylinders. The inventor has provided ingenious improvements in the construction of the cylinders and in that of the piston, and other improvements in the general and detail construction of the engine. It is one of the novel features of the invention that the pistons are arranged to receive steam consecutively and to avoid the wear and tear incident to operating the engine on one side only, the steam operating upon the engine continuously on opposite sides.

AUTOMATIC STOP AND EMERGENCY GEAR FOR MARINE AND STATIONARY ENGINES.—Henry J. Teiper, Manhattan, New York city. The gear comprises a lever receiving a continuous swinging motion from an operating part of the engine; a connection with the throttle-valve of the engine, to hold the valve normally open; and an actuating device on the lever, normally locked in a dormant position. A spring moves the device to actuating position, and a releasing device unlocks the actuating device and engages it with the connection, to actuate the connection upon a further movement of the lever and to release the throttle-valve. The gear will automatically close the throttle-valve if the engine should begin to race by reason of the breaking of a shaft or belt, or for any other cause.

VALVE.—Timothy S. Martin, Butte, Mont. Mr. Martin has endeavored to provide an improved valve for the purpose of controlling several passages at the same time, as for instance, in radiators. The valve-casing has four ports arranged in pairs; a valve controls the connection between the ports of one pair; and another valve controls the connection between the ports of the other pair. By means of a connecting member the valves are compelled to move in unison. A third valve controls the connection between the port of one pair and a port of the other pair, the stem of the valve screwing into a stationary part and into the connecting members, the two screw-threads being of opposite directions and of different pitch. The device is positive in its movement.

Mechanical Devices.

WELL-DRILLING APPARATUS.—Frederic W. Bushner, Neosho, Mo. In this apparatus for drilling wells the jerk-rope for actuating the drill is driven by a swinging arm or walking-beam. By this means the jerk-rope is operated in a more regular and effective manner than heretofore. The maximum amount of power is applied from a minimum of expenditure.

DOOR-CLOSING DEVICE.—Martin F. Hines, Brooklyn, New York city. The invention is useful in many connections, a notable example of which is in fire-engine houses, in which the doors are opened for the exit of the team and engine, and in which it is desired automatically to close the doors at a certain time after the passage of the team and engine and the firemen. In combination with a door and means for closing it, and means for holding it open, the inventor employs an inclined way on which a ball is arranged to run. A mechanism controlled by the door restrains and releases the ball. Means are operated by the ball for actuating the door-releasing means.

SAW-FILING MACHINE.—Charles Young, York, Me. The machine is more especially designed for filing band-saws. The construction is simple and durable; and the operation is very effective. The saw is automatically and securely clamped in place during operation, the file moving back from the cutting point of the tooth at the end of the filing stroke to leave an accurately-filed tooth, and to permit the feeding of the saw forwardly during the return stroke of the file. Sufficient jar is given to the file to dislodge the filings, thus leaving the file in proper condition for accurate working.

Miscellaneous Inventions.

LOCOMOTIVE HEAD-LIGHT.—John S. Henderson, 219 North Market Street, Nashville, Tenn. The locomotive head-light is pivoted and is adapted to turn so as to throw the light upon the track when rounding a curve instead of throwing it at a tangent to the curve as happens when the light is fixed.

CHIMNEY-BASE.—John King, Quitman, Ga. The improved base supports the weight of a chimney where it starts from and is carried upon ceiling-joists, and receives the upper end of a stovepipe from the story below. The base consists of cast-iron plates which are connected with the joists whereby a practically fireproof construction is provided.

POOL-TABLE.—Jacob H. Genter and Joseph Besch, Albany, N. Y. The object of the invention is to provide a new pool-table designed for playing "cocked-hat pool." The pool-table has a cushioned rail, and has its head portion approximately semi-circular and formed with spaced pockets ranging radially. These pockets are of different sizes. An annunciator is provided, arranged to be actuated by a ball dropping through one of the pockets. A return-chute for the balls is provided, which chute receives the balls from the annunciator.

FUNNEL-HOLDER.—Julius R. and Marie P. Hoffman, Canajoharie, N. Y. The invention provides a new holder for supporting filling funnels over the bung-holes of casks. The funnel-holder consists of a support for the funnel, and clamping arms depending from the support and adapted to pass into a bung-hole to engage the wall thereof.

HAND-CASE.—Joseph A. Conboie, Virginia City, Nev. The device is intended to facilitate "laying out" or, in other words, properly disposing the hands of a corpse. The hand-case comprises two rigid sections arranged to encase the hand. Means are provided for removably fastening these sections together. A waterproof mit is arranged to inclose the sections of the case when a bleaching fluid is used.

FIRE-EXTINGUISHER.—Edgar H. Ellis, Brooklyn, New York city. The novel features of this invention are to be found in a number of traps containing the fire-extinguishing liquid. When the extinguisher has been used then one or more of the traps are filled with liquid. Air cannot escape from the pressure-chamber beyond the first filled trap, no matter in what position the extinguisher may be placed—upside-down, for instance. Furthermore, when the traps are once filled they cannot all be emptied no matter in what positions the extinguisher may be placed. The strength of the solution in the outer receptacle and that which may be left in the traps is left unimpaired. There can be no escape of gases at any time. The device is positively hermetically sealed. The first portion of the solution is of the same strength as the last, which is not the case with most extinguishers heretofore constructed.

CLAMPING DEVICE.—Frederick C. Billings, Macon, Mo. The invention relates to means for preventing the displacement of bed-coverings while the bed is in use, and has for its object to provide a simple and inexpensive clamping device for this purpose, which is cheap and strong, is fully concealed from view when applied for service, and is adapted for convenient adjustment to clamp the bed-clothing at the side edges of the bed.

THILL-COUPLING.—Edward P. Bowles, Wolfville, Nova Scotia, Canada. The improved coupling device is intended for the connection of thills or shafts of a vehicle with the running-gear, so as to prevent looseness of the joints and obviate the rattling incident to couplings of ordinary construction. Convenient means are provided for adjustment of the working parts to take up wear in any direction.

TESTER.—Emil A. Starz, Helena, Mont. This instrument is a urine-tester of simple, compact construction and accurate in operation. The urine can be used in testing for albumen and sugar (glucose), both qualitative and quantitative.

CIGAR-CONTAINER.—Arthur Q. Walsh, Manhattan, New York city. This cigar-box is constructed of metal, the body section being provided with a gutter at its top, and the collar having a flange arranged to extend into the gutter. Wipers are provided for the flange. A cigar-container constructed as described can be made to hold a number of boxes of cigars and will effectually prevent the evaporation of moisture from the cigars, the gutter containing a dry seal. The cigars when removed will be in practically the same condition as when they were packed.

WEATHER-STRIP.—Barnet M. Whiting, Spokane, Wash. This invention relates to a weather-strip adapted especially for application to doors, or other swinging closures; and it comprises a strip mounted to have a parallel movement on the door or other part and arranged with a spring in a certain peculiar manner, so that as the door is closed the weather-strip is moved against the spring in a direction away from the door, so as completely to close any space between the door and the framing in which it is mounted.

SUPPORTING-BAR FOR GLASS OR TILING.—Leonard Sborigi, Manhattan, New York city. The purpose of the invention is to provide a supporting-bar for panes of glass or blocks or sections of tiling, so constructed that the bar will withstand great strain and will firmly hug the material received under shock or pressure, and to provide a construction of the character described, which will be simple, durable, and economic and applicable to outside or sash bars as well as to inside or intermediate bars.

TANK FOR GAS-HOLDERS.—Otto Intze, Aix-la-Chapelle, Germany. Of recent years it has been sought to construct specially large tanks of metal and at the same time reduce their weight to a minimum, so as to lessen their cost and the strength of the foundation on which they are placed. The present invention is an improvement in this direction and permits a tank to be made of any large diameter, while making the walls and other parts of relatively thin plates. The material can further be utilized up to its highest possible admissible strain-resisting capacity, and the tank can be erected in a simple way after the largest and heaviest parts or elements thereof have been almost wholly prepared in the shops. The simplifying of the erection enables the necessary time for the same to be shortened, and large tanks may be constructed in a much cheaper and more trustworthy manner.

Designs.

ABDOMINAL CORSET.—Philo B. Sheldon, Erie, Pa. Below and above the corset are two separated and parallel vertically-extended strips. From the upper portions shoulder-straps extend; from the lower portions a stomach-pad is suspended.

TREE-PROP.—Robert S. McIntyre, Riverside, Cal. The inventor has devised a simple and efficient prop for fruit trees, comprising essentially a shank terminating at one end in a curved saddle. The shank has a slot, and side portions of the shank are bent longitudinally in the lines of the slot walls to form flanges. At each end of the slot is a spur which serves as a means for holding the prop in place.

Note.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**

MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 1605.—For an apparatus to make charcoal.

Turbines.—Leffel & Co. Springfield, Ohio, U. S. A.

Inquiry No. 1606.—For outfits for making rubber stamps and supplies for the business.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 1607.—For manufacturers of key rings, checks and outfits for stamping names on same.

WATER WHEELS. Alcott & Co., Mt. Holly, N. J.

Inquiry No. 1608.—For manufacturers of chain-making machinery.

Gasoline Lamps and Systems. Tufner Brass Works, Chicago.

Inquiry No. 1609.—For parties engaged in malleable iron works.

Foot presses and dies. Amer. Hdw. Mfg. Co., Ottawa, Ill.

Inquiry No. 1610.—For manufacturers of springs.

Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No. 1611.—For a ½ or ¼ horse power gasoline engine.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 1612.—For parties engaged in removing the solder and tin from old cans.

For Sheet Brass Stamping and small Castings, write Badger Brass Mfg. Co., Kenosha, Wis.

Inquiry No. 1613.—For manufacturers of catsup bottle covers.

Rigs that Run. Hydrocarbon system. Write St. Louis Motor Carriage Co., St. Louis, Mo.

Inquiry No. 1614.—For producer gas plants for operating gas engines consuming not over 5,000 cubic feet of gas per ten hours.

Ten days' trial given on Daus' Tip Top Duplicator. Felix Daus Duplicator Co., 5 Hanover St., N. Y. city.

Inquiry No. 1615.—For manufacturers of freight automobiles with detachable gasoline engines for use on a desert.

Metal Stamping Co., Niagara Falls, N. Y., cuts and forms sheet, bar, rod, or wire any shape.

Inquiry No. 1616.—For parties engaged in bicycle merry-go-round experimental work.

Kester Electric Mf'g Co's, Self-fluxing solder saves labor, strong non-corrosive joints, without acid, Chicago, Ill.

Inquiry No. 1617.—For manufacturers of machines for pulverizing pitch and rosin, also machines for pulverizing coal slack rapidly.

Automobiles built to drawings and special work done promptly. The Garvin Machine Co., 149 Varick, cor. Spring Streets, New York.

Inquiry No. 1618.—For machinery for making clothes pins.

New Book, Electric Gas Lighting, 50c. Send for full descriptive circulars, free. Spon & Chamberlain, 12 Cortlandt Street, New York, U. S. A.

Inquiry No. 1619.—For manufacturers of steam copper-jacket kettles for boiling syrup.

Manufacturers of patent articles, stamping dies, tools, light machinery. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 1620.—For manufacturers of compressed air in portable receptacles.

Designers and builders of automatic and special machines of all kinds. Inventions perfected. The W. A. Wilson Machine Company, Rochester, N. Y.

Inquiry No. 1621.—For manufacturers of steel springs such as are used in spring leggins.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

Inquiry No. 1622.—For parties to manufacture a coffee and tea making apparatus.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4. Munn & Co., publishers, 361 Broadway, N. Y.

Inquiry No. 1623.—For manufacturers of machinery for converting wood into paper pulp.

Wanted.—A competent and energetic draughtsman, about 33 to 35 years, up in modern methods, to take charge of small machine shop. Good pay to right man. One familiar with bleaching and dyeing machinery preferred. Address, giving full information and wages expected, B. B., No. 32 Kent St., Somerville, Mass.

Inquiry No. 1624.—For manufacturers of copper smelting plants.

For Sale or on Royalty.—Patent No. 683,747 issued October 1, 1901. A foot-warmer designed upon sanitary principles to relieve people suffering from cold feet. Useful in homes, hotels and hospitals. For specifications and full particulars address Frank Gotsche, 416 Hoffman Avenue, San Francisco, Cal.

Inquiry No. 1625.—For manufacturers of flouring mill machinery.

☞ Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Inquiry No. 1626.—For dealers in the Herans electrical pyrometer.

Wanted.—Manufacturer for pneumatic grip; also filing case. H. W. Conard, Wymore, Neb.

Inquiry No. 1627.—For manufacturers of aluminium articles, such as spoons, etc.

Inquiry No. 1628.—For dealers in sheet-iron stampings for field and armature for small alternating power and fan motors.

Inquiry No. 1629.—For an engine and dynamo to supply electric lights for a town. Outfit to be either second-hand or new.

Inquiry No. 1630.—For manufacturers of roofing slag.

Inquiry No. 1631.—For manufacturers of cranks and chain hoists.

Inquiry No. 1632.—For dealers in butcher knife and razor handles

Inquiry No. 1633.—For manufacturers of electric welding machines.

Inquiry No. 1634.—For dealers in a pressure pump for forcing grout into cracks on stone or concrete walls. It is similar to a bicycle pump, but larger, and can be loaded from the top.

Inquiry No. 1635.—For two hydraulic rams, pipe and fixtures for supplying water from a spring.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending

November 12, 1901,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Air, apparatus for the liquefaction of atmospheric, O. P. Ostergren 686,530
Air compressor for automobile alarm whistles, C. C. Bowen et al 686,438
Alarm. See Low and high water alarm.
Alarm gage, E. Fortier 686,671
Amalgamator, F. J. Hoyt 686,300
Antichafing device, S. E. L. Wilson 686,498
Ashes removing apparatus, antidust, Adams & Howland 686,500
Axle lubricator, A. R. Carr 686,588
Axle, vehicle, A. R. Long 686,410
Ball retainer, H. B. Keiper 686,617
Battery gage, C. R. Underhill 686,561
Bearing, roller, A. E. Henderson 686,403
Bed, trundle, C. Simmons 686,550
Bell, electric, J. J. Mossop 686,526
Bell, tubular, C. A. Jacques 686,301
Bevel shears, rotary, C. J. Wangler 686,641
Bib, F. E. McCathie 686,631
Binders and harvesters, folding reel for, B. A. Selph 686,545
Boiler flue plug, W. G. Cogswell 686,387
Boiler tube, J. Devantery 686,269
Boiler water circulation, S. D. Mott 686,527
Boilers, apparatus for maintaining the water line in steam, G. I. Rockwood 686,342
Bookbinding, B. F. Welker 686,373
Boot drier, H. C. Mansfield 686,314
Bottle stopper, C. Marchand 686,315
Bottle stopper, L. Amberg 686,522
Bottle stopper, H. Wayte 686,642
Box fastener, Dillenbeck & Flueso 686,271
Brake beam, F. B. Aglar 686,378
Brake head, W. D. Sargent 686,344
Brakes of railway vehicles, apparatus for automatically applying, Witting & Distritenau 686,431
Brick kiln, W. H. Patton 686,326
Brick kiln, W. Joyce 686,407
Brick machine, D. A. Keizer 686,659
Brick molding and pressing machine, A. E. Volkersen 686,370
Broom rack, T. A. Sollars 686,639
Brush, C. M. Higgins 686,655
Brush machine, W. H. Gates 686,448
Buckle, T. H. Fishel 686,690
Buckle, thill tug, J. T. Cooney 686,589
Burner, G. Machlet, Jr 686,625
Butter cutter, H. B. Waters 686,667
Button hook, C. A. O'Connor 686,325
Buttonhole stitch gage and cord guide, J. T. Killmeier 686,305
Cage chair, safety, M. W. Jeleinek 686,658
Calking device, M. Dunn 686,274
Cans, treating food products in, Cameron & Clingen 686,259
Capstan or windlass, T. G. Cantrell 686,441
Car coupling, Hazlett & Rich 686,518
Car door, grain, J. D. Horton 686,299
Car replacer, R. E. Alexander 686,241
Card receptacle, R. A. Simonson ... 686,357
Carpet beating frame, J. Smith 686,552
Cartridge, subcaliber, M. J. Wheeler 686,375
Case. See Show case.
Cash register, Watson & McGraw 686,683
Casket or coffin handle, F. Gaudin 686,280
Chain link, wire, A. K. Lovell 686,464
Chain, wire, A. K. Lovell 686,465
Chair, T. J. Florey 686,279
Channel cutting and flap turning machine, G. E. Warren 686,371
Charging and drawing apparatus, S. C. Collin 686,508
Chuck, lathe, C. F. Williams 686,568
Churn, L. A. Baxter 686,436
Churn, J. Ranz 686,479
Chute, J. W. Haywood 686,452
Cigar lighting apparatus, electric, C. J. Brosnan 686,583
Circuit closer, time, W. Rausch 686,636
Cloth cutter, G. J. Nopper 686,529
Clothes drier, Verbeke & Wright 686,492
Clothes line reel, H. Huebner 686,456
Cock, ball, W. H. Rawe 686,335
Cock or valve for casks, barrels, etc., C. Hutchinson 686,614
Coffee extract, making concentrated, H. Eschwege 686,689
Coffin, L. G. Kregel 686,308
Coin sorting machine, J. J. Hoey 686,811
Condenser, steam, F. W. Wolf 686,432
Conveying and loading crops or merchandise, machine for, C. Crozier 686,511
Cooling apparatus, C. A. Schneible 686,542
Cooling apparatus, K. S. Lemstrom 686,619
Copying, composition of matter for, R. J. Kirkland 686,661
Cot, folding, C. J. Follett 686,649
Cotton cleaning and mattress stuffing machine, C. W. White, reissue 11,944
Crank, E. Y. Moore 686,628
Crate, fruit or vegetable, R. K. Pollock 686,329
Cream tempering, churning, and butter making machine, Virtue & Hagedorn 686,369
Crib, child's, G. W. Gerding 686,516
Crushing mill, T. L. & T. J. Sturtevant 686,364
Cultivator, G. B. Todd 686,559
Cultivator fertilizer distributor attachment, H. B. Williams 686,430
Cultivator, planter, and fertilizer distributer, combined, A. J. West 686,496
Cultivator, straddle row, N. S. Barger 686,503
Curbing device, grave, F. C. Rheubottom 686,536
Current protector, strong, Seeley & Silet 686,350
Current transmission, alternate, W. M. Mordey 686,416
Currycomb, R. J. Edwards 686,397
Cutter head, C. Seymour 686,548
Cutting pieces of uniform lengths from rods or bars, machine for, F. H. Pierpont 686,327
Cycle, motor, E. F. Gottschalk, (now E. F. Stratton) 686,284
Damper, fireplace, R. Jahn 686,615
Decolorizing charcoal and filtering compounds, making, C. C. Barnes 686,248
Dental articulator, C. Huberty 686,613
Detergent, Shehadi & Faris 686,665
Dish cleaner, D. W. Hawkes 686,450
Display cabinet, G. W. Barnett 686,381
Dividing engine, A. L. De Leeuw 686,266
Door closure and screen, combined, L. C. Herdrich 686,297
Double acting band brake, H. A. Tuttle 686,429
Draft equalizer, G. H. Krueger 686,309
Draft equalizer, H. C. Burk 686,586
Drawer lock, J. T. Hicks 686,519
Drawings, device for coloring, C. W. A. Koelkebeck 686,462
Drier car, E. H. & F. E. Frey 686,514
Drill attachment, J. Burgh 686,257
Drill holder, W. D. Rearwin 686,534
Drinking fountain for stock or poultry, A. J. Goodrich 686,401
Driving mechanism, J. N. Wright 686,685
Dye and making same, brown anthracene, S. E. Simon 686,356
Easel support, A. B. Murray 686,417
Electric controller, G. J. Scott 686,349
Electric currents, distribution of, E. Arnold et al 686,434
Electric currents, liquid interrupter for, J. O. Heinze, Jr 686,295
Electric cut off for emergencies, J. H. Johnson 686,459
Electric furnace, J. H. Morley 686,525
Electric furnace, A. Simon 686,551
Electric meter, J. Cauderay 686,507
Electric transfer apparatus, H. H. Porter, Jr 686,330
Electric wire conduit, E. D. Page 686,419
Electric wiring, rosette for, J. H. Cramphorn 686,443
Electrical resistance, Bachmann & Vogt 686,245, 686,246
Electrodes, making storage battery, L. Paget 686,679
Elevator hatches, automatic catch for, F. T. Martin 686,316
Engine. See Dividing Engine.
Engine, H. J. Bell 686,686
Engine feed mechanism, gasoline or like, C. R. Greuter 686,287
Engine speed regulator, explosive, F. B. Stearns 686,554
Engine stop mechanism, J. H. Cary 686,668
Envelop and letter sheet, combination, A. Collins 686,260
Eye tester, pocket, H. D. Reese 686,535
Eyes, apparatus for testing the strength and relative action of the extraneous muscles of the, R. N. Johnquest 686,616
Faucet, J. A. Wight 686,566
Feed water heater, A. S. Mann 686,313
Feed water regulator, G. U. Merrill 686,413
Feeder, boiler water, S. D. Mott 686,528
Fence post, W. C. Zickefoose 686,433
Fire escape, I. R. Johnson 686,458
Fishing reel, W. Shakespeare, Jr 686,353
Fishing rod, W. H. Booth 686,647
Flooring jack, adjustable, C. S. Losie 686,622
Flue or pipe cutter, Boyd & Gable 686,252
Fly trap, W. Fritsch et al 686,447
Forceps, D. F. Bowersox 686,578
Funnel, H. Katz 686,304
Furnace, W. B. Estes 686,276
Game, H. Procopee 686,478
Gang plank, W. F. Uphoff 686,490
Garment fastener, A. J. Bradley 686,439
Gas and air mixer, B. Murray 686,418
Gas compressing apparatus, W. T. Sugg 686,427
Gas generator, acetylene, P. E. Ward 686,564
Gas generator, acetylene, L. A. Boyer 686,579
Gas generator, acetylene, T. A. Bryan. 686,584, 686,585, 686,648
Gas governor, automatic, H. H. Klayer 686,307
Gas meter, dry, A. Schofield 686,348
Gas producer, R. L. Morgan 686,629
Gate, T. J. Alsop 686,242
Gate, W. H. Thayer 686,489
Gear coupling, universal, J. D. Artz 686,501
Gear generating cutters, machine for grinding, E. R. Fellows 686,599
Gear, variable speed, Ough & Waddell 686,471
Glass articles, machine for the manufacture of pressed, G. H. Gray 686,285
Glassware, apparatus for manufacturing articles of, F. R. Gillinder 686,517
Glassware into and through annealing ovens, apparatus for conveying, Bridgwater & Haley 686,254
Glove, I. J. Bradshaw 686,253
Golf apparatus, E. Crowe 686,265
Golf club bag support, J. P. Goodbun 686,283
Governor, pressure, D. Donohue 686,396
Governor, speed, F. H. Cheyne 686,386
Grain separator, W. S. Currier 686,593
Grater, vegetable, J. F. Rote 686,421
Hammer, power, M. Erickson 686,275
Handcuff, L. F. Maltby 686,626
Hand protector, R. A. Ritchie 686,339
Handle. See Casket or Coffin Handle.
Harness, O'Leary & McCarty 686,635
Harness ornament, R. C. Beecher 686,572
Harrow and cultivator, combination, A. A. Billingslea 686,575
Hat bodies, apparatus for treating felt, C. E. Keator 686,460
Hat brim curling machine, R. G. & G. Segsschneider 686,351
Hats, manufacture of felt, C. E. Keator 686,674
Hay or cotton press, R. Hamilton 686,607
Heating apparatus, W. Dawson 686,393
Heating system, steam, J. A. Trane 686,666
Heddle frame, selvage, T. D. Wilmarth 686,569
Heel compressing machine, D. C. Beck 686,382
Hinge, Carter & Hausfeld 686,384
Hinge, W. Gossett 686,603
Hog dressing rack, M. Voigt 686,494
Horseshoe, adjustable, G. S. Vogt 686,493
Hydraulic press, A. H. Ketcham 686,660
Ice perforator, shaved, E. G. De Ry 686,268
Impact motor, C. Hahn 686,653
Inhaler, W. B. Dewees 686,270
Initiating apparatus, C. B. Post 686,331
Injector, hypodermic, W. M. Haynes 686,451
Insulating support for electric wires, R. G. Hemingray 686,609
Invalid lifting and moving device, H. Sommerfeld 686,425
Knob, alarm door, F. J. Gustine 686,652
Knob attachment, H. C. Pruce 686,533
Label holder, F. B. & M. S. Grove 686,289
Lamp, miner's, M. F. Hammond 686,290
Lamps, hanger board for series arc, E. O. Lundin 686,312
Leather, grain, M. Pianko 686,476
Leather stretching device, J. Caldwell 686,506
Lens grinding machine, E. M. Long 686,676
Letter box, post office, P. Schultz 686,543
Letter sheet and envelop, combined, A. Collins 686,261
Level, extensible, Smiddy & Zern 686,360
Lever, lifting, L. E. Waterman 686,372
Life preserver, E. S. Magnin 686,412
Life preserver, F. Krajca 686,618
Lifting device for flanged articles, M. C. Miller 686,415
Lifting jack, W. H. Cox 686,591
Load retaining apparatus, vehicle, W. M. Cain 686,587
Loom shuttle, D. Sussman 686,555
Loom warp stop detector, H. Wyman 686,499
Loom warp stop motion, A. E. Stafford 686,485
Low or high water alarm, R. C. Blake 686,383
Magnetic separator, T. J. Greenway 686,402
Mail bag crane, W. W. Shea 686,354
Mail bag holder and deliverer, A. J. Pennington 686,474
Mail box attachment, J. L. Plank 686,328
Malt turning apparatus, green, F. Singer 686,359
Manganese, preparing an acetylene preparation of, T. Macalpine 686,663
Mangle, steam, Casper & Gerder 686,385
Manual motor, G. A. Thode 686,366
Manure gatherer and loader, J. Peterson 686,532
Marking device, W. R. Morse 686,692
Massage glove, R. E. Saffold 686,638
Match box friction attachment, C. J. W. James 686,657
Measuring instrument, E. Hill 686,455
Metal rods, die for drawing, G. E. Thackray 686,365
Metal working machine attachment, R. B. Perrott 686,681
Metals, apparatus for electrocoppering, E. L. Dessolle 686,395
Metals, minerals, ores, etc., apparatus for locating, A. F. McClatchey 686,632
Micrometer gage, telescopic, T. Wiedemann 686,497
Microscopes, mechanical stage for, A. F. Martins 686,466
Mill. See Crushing Mill.
Mining machine, subaqueous, S. C. Monberg 686,467
Mixing machine, portable mortar, concrete, or like, A. Wilcox 686,567
Mowing machine, G. W. Hinchman 686,405
Music box, G. Varrelman 686,562
Music spool, perforated, H. H. Mansfield 686,664
Musical instruments, mechanism for operating mufflers on, W. C. Bosenbury 686,251
Musical instruments, pneumatic key striker for mechanical, H. M. Salyer 686,682
Nail coating, J. A. Henderson 686,654
Nail puller, J. B. Salo 686,540
Needle making machine, E. Fontaine 686,398
Nut, lock, W. N. Mecklan 686,318
Nut lock, Beach & Baker 686,504
Oiling overhead cables, means for, C. Larsen 686,521
Ore separator, J. Conley 686,263
Pail holder, milk, W. S. Sherd 686,422
Paper box, circular or eliptical knockdown, G. V. Russel 686,343
Paper, copying, J. F. Lester 686,620
Paper folding machine, H. K. King 686,306
Paper folding machine, H. F. Bechman 686,593
Paper size, producing, J. Wezel 686,374
Peeling machine, potato, J. Blache 686,576
Pen, fountain marking, F. X. Koempel 686,675
Perforating machine for tapes of paper, etc., F. G. Creed 686,510
Phonograph, F. Myers 686,321
Photographic vignetting apparatus, W. Anderson 686,243
Pianos, mechanism for adjusting music desks on, W. C. Bosenbury 686,250
Piles, protecting, E. Gold 686,282
Pine coupling, A. N. Wilson 686,571
Pipe joint, expansion, Q. N. Evans 686,598
Pipe threading machine, B. Borden 686,577
Planing machine, J. R. Thomas 686,428
Plaque hanger, J. Frenzel 686,601
Plow attachment, C. Haynes 686,294
Plow, reversible, T. A. Jackson 686,457
Plow, stirring, J. Sprecht 686,426
Pneumatic despatch tube carrier, A. W. Pearsall 686,680
Preserving foods, J. F. McAnany 686,322
Printing, lithographic, F. Billing 686,574
Printing machine paste fountain, G. F. Read 686,336, 686,337
Printing machine tripping mechanism, cylinder, J. White 686,376
Printing press, J. F. Ames 686,380
Projectile, A. J. Robertson 686,637
Pump, stomach, W. Gerry 686,281
Radiator, wrought metal, F. A. Wilmot 686,570
Railway, electric, L. Woods 686,644
Railway signal, G. W. Harris 686,645
Railway, single line, Fisher-Spenser & Brunlees 686,293
Railway ties, forming, D. G. Ross 686,640
Railways, third rail safety system for electric, Schlechtiger & Bingham 686,539
Razor stropping machine, A. L. Silberstein 686,541
Razors, holder for stropping safety, J. A. Butler 686,549
Refractory materials, manufacture of, R. J. Friswell 686,505
Refrigerating and ventilating apparatus, O. P. Ostergren 686,672
Refrigerating system, car, J. O. Morris 686,531
Rein holder, C. P. Uhlmann 686,630
Riveting machine, Sellers & Lewis 686,560
Rock drill, H. D. Crippen et al 686,352
Roll holder, H. McKay 686,444
Rolling metal, hotbed for, A. J. Demmler 686,324
Roof collar, M. L. McGuire 686,267
Rope machine, O. Bucklin 686,323
Rotary engine, F. R. Strunk 686,440
Rotary engine, H. E. Smallbone 686,363
Rotary motor, W. Deiwiks 686,482
Rudder chains of ships, yielding guide roller for, A. May 686,394
Sad iron, W. E. Hoyt 686,317
Sash cord guide, R. M. Elliott 686,612
Sash fastener, E. Schindler 686,513
Sash fastener, W. S. James 686,345
Saw, W. T. George 686,673
Saw, hack, E. R. Fellows 686,399
Sawmill carriage offset, A. Cunningham 686,600
Saw set, C. Morrill 686,392
Saw swage, C. H. Van Auken 686,468
Scholar's companion, J. Beery 686,491
Screen plate holder, Brawn & Fitzgerald 686,249
Screw coupling, J. M. Cox ..... 686,388 to 686,391
Screw driver kit, W. J. Smith 686,581
Screw tap, etc., H. W. A. Fette 686,424
Seal, car, C. W. Richards 686,278
Seals to envelopes, device for applying metallic, J. W. Cushman 686,480
Sealing cap, vessel, A. A. Low 686,595
Sealing means for vessels, A. A. Low 686,623
Serums, device for storing and administering, H. F. Prescott 686,624
Sewing machine, broom, A. E. Miller 686,332
Sewing machine, double zigzag, H. A. Klemm 686,414
Sewing machine presser foot holder, J. M. Greist 686,662
Sewing machine ruffler, A. Johnson 686,286
Sewing machine stitch separating mechanism, H. C. Peters 686,302
Shade bracket, adjustable window, A. H. Chellis 686,475
Shade roller and curtain pole bracket, combined, J. Joubert, Jr 686,442
Shade trimming device, H. C. Chaffee 686,303
Shaft coupling and antirattler, R. H. Hearn 686,687
Shaft support and antirattler, combined, G. S. Johnson 686,454
Shaft, vehicle, T. J. Waddell 686,406
Shaving cup, S. W. Babbitt 686,495
Shearing knife, spiral, F. Schlenter 686,502
Sheep dipping composition, R. Mackill 686,346
Ship's port hole, J. D. Hannah 686,411
Shoe horn, B. F. Duvall 686,291
Show case, C. F. Murray 686,512
Show case fixture, electric, E. A. Lowe 686,320
Sifting device, J. H. Cope 686,524
Signature gathering machine, H. L. Roberts 686,669
Skirt, L. Gluck 686,538
Soda water apparatus, C. A. Geddes 686,400
Soda water dispensing apparatus, W. Helmer 686,515
Soda water dispensing apparatus, Tufts & Helmer 686,296
Spark arrester, A. E. Hess 686,368
Speed changing and reversing gear, H. E. Brown 686,404
Spinning spindle, W. F. Draper 686,256
Spoke tenoning and cut off machine, C. Seymour 686,446
Stacker, hay, J. F. Hazel 686,546
Stacker, hay or grain, R. D. McKee 686,453
Stall floor, W. F. L. Spengler 686,469
Stamp, adjustable hand, J. A. Crandall 686,553
Stamp, time, J. G. Hallas 686,509
Station indicator, O. B. Thompson 686,606
Steam boiler, electrical, C. E. Griffing 686,367
Steam engine, G. B. Smith 686,288
Steam generator, R. Damonte 686,483
Steaming apparatus for the head, dermal, M. J. Fitzgerald 686,596
Stone, making artificial, P. J. Prior 686,670
Stove, cooking, A. Ohnemus 686,333
Sugar, drying, F. Mahoudeau 686,634
Surgical safety appliance, A. W. Ready 686,677
Suspender attachment, A. L. Nelson 686,338
Swinging chair and crib, combined, G. W. Powell 686,470
Tackle block, A. E. Taylor 686,420
Telephone apparatus, E. W. Hazazer 686,557
Telephone cabinet, E. W. Smith 686,608
Telephone circuits, service meter apparatus for, E. C. Robes 686,423
Telephone receiver, W. F. Taylor 686,340
Telephone switchboard system, F. W. Dunbar 686,488
Tension coupling and sound deadener, automatic, Grauel & Gallagher 686,272
Thread, device for stripping wax from, J. B. Dobyne 686,605
Thread waxing device, J. Keats 686,445
Tie fastener, E. F. Priddat 686,461
Tile making machine, A. J. Hoban 686,477
Time alarm, H. Lewis 686,656
Tire, bicycle, B. Broughton 686,523
Tire for bicycles, self inflating, C. G. Morgan 686,255
Tires to wheels, means for securing elastic, Swinehart & Byrider 686,319
Tool holding device, M. Dunn 686,556
Torch for lighting gas lamps, Simmance & Abady 686,273
Torpedo, marine, G. Ansaldo 686,355
Towel cabinet, roller, F. H. Curtis 686,646
Trap. See Fly Trap.
Trap, C. M. Shafer 686,594
Trimming, F. A. Kursheedt 686,481
Trolley wire hanger, G. W. Gurten 686,408
Trousers former, A. W. Ewers 686,651
Truck center plate, car, J. C. Barber 686,277
Truck side bearing, J. S. Pearce 686,247
Truck side bearing, car, Aglar & Steinbrenner 686,473
Trunk, W. Hossfeld, reissue 686,379
Tube connection, E. S. Leacraft 11,943
Tubes, pipes, etc., apparatus for manufacturing, E. Thomson 686,311
Tubular ball mill, P. T. Lindhard 686,558
Tufting board, C. F. Streit 686,621
Tufting frame, F. A. Neider 686,362
Turpentine hack and shave, J. P. Council, Jr 686,633
Twisting machine feed mechanism, P. Hardman 686,590
Typewriting and computing machine, combined, H. Marshall 686,292
Typewriting machine, W. J. Barron 686,627
Typewriting machine, B. C. Stickney 686,435
Typewriting machine, Hess & Stoughton 686,487
Umbrella, self opening, Schoenberg & Miller 686,610
Valve, automatic shut off, N. C. Locke 686,347
Vapor burner, incandescent, J. A. Putt 686,409
Vehicle antirattler, T. Y. Pamplin 686,334
Vehicle brake mechanism, W. Winkler 686,472
Vehicle driving gear, motor, H. Spurrier, Jr 686,643
Vehicle jump seat, G. H. Hutton, Jr 686,361
Vehicle motor attachment, road, H. J. Lawson 686,520
Vehicle seat, two wheeled, A. P. Millard 686,310
Vehicle steering gear, P. H. White 686,678
Vehicle wheel, G. S. Lee 686,684
Vending machine, coin controlled, W. H. Garland 686,463
Vessel floating apparatus, A. S. Debose 686,650
Vise, W. E. Snediker 686,597
Vise, C. N. Grace 686,484
Wagon or other vehicle, J. B. Rhodes 686,604
Water, chemical compound for treating, W. F. Eger 686,537
Water closet tank, J. J. G. Crosby 686,688
Water level in reservoirs, apparatus for maintaining the, G. I. Rockwood 686,592
Water meter, E. M. Hackett 686,341
Water motor, reciprocating, C. L. Wilkins 686,449
Wave motor, M. Gehre 686,377
Weather strip for doors, automatic and reversible sheet metal, C. A. Armantrout 686,602
Web folding machine, A. V. Walker 686,244
Weighing machine, automatic, J. B. Schuman 686,563
Wells, automatic casing perforator for deep, E. A. Hardison 686,544
Wheel rim finishing machine, automatic, C. Seymour 686,691
Wheelbarrow, Cone & Cooper 686,547
Wheelbarrow, O. Hoffmann 686,262
Wheelbarrow frame, F. J. Cooper 686,298
Winding machine, bobbin, F. A. Brackett 686,264
Winding mechanism for warps or threads, White and Hargreaves 686,580
Wood and making the same, waterproofed, H. R. Brinkerhoff 686,565
Wrench, G. W. Boozer 686,582
Yoke, neck, Buzard & Norton 686,437
686,258

DESIGNS.

Book edge protector, C. Chivers 35,284
Broom holder member, F. W. Pendergast 35,289
Display box, T. F. Curley 35,285
Gas vaporizing frame, C. V. Best 35,287
Hammer, H. MacDermott 35,290
Mustache guard, J. W. Brayman 35,281
Sash ventilator, window, S. W. Sherman 35,286
Thermometer mounting, G. E. Taylor 35,282 35,283
Trace fastener, R. H. Berkstresser 35,288

TRADE MARKS.

Bakery products and confectionery, certain named, National Biscuit Co 37,299
Butter, Continental Creamery Co 37,301
Cellulose, corn, B. G. Krapf 37,296
Cloaks and suits, ladies', S. Rothschild & Bro. 37,289 37,290
Coffees, teas, spices, and extracts, W. McMurray 37,300
Corn husking and shredding machines, Rosenthal Husker Co 37,313
Dressings, certain named, A. E. Little & Co. 37,305
Drunkenness, cure for, S. P. Palmer 37,306
Dry goods, certain named, A. F. Bornot 37,292 37,293
Engineers' mill, marine, and other motive power supplies, fittings, and findings, certain named, Eagle Oil and Supply Co 37,314
Fabric, certain named, Williams, Brown & Earle 37,294
Food preparations, cereal, Eata Malt Food Co. 37,302
Medicines in powdered form, headache, Eureka Medical Company 37,307
Organs, certain named parts or attachments for pipe, Aeoline Co 37,312
Perfumed lozenges, T. Kerfoot & Co 37,298
Powders for gynecological purposes, R. H. Eddy 37,310
Pumps and nipples, breast, W. H. Martin 37,311
Remedy for certain named diseases, J. S. Finlay 37,309
Remedy for diseases of kidneys and bladder, P. Rambo 37,308
Scouring powder, Michael Paint Co 37,303
Socks, ladies', misses', and children's stockings, gentlemen's, Iowa Knitting Co 37,291
Tobacco pouch, Davidson Rubber Co 37,295
Toilet and medicinal preparations, certain named, Powers Mfg. Co 37,304
Watches, E. Merani 37,288
Whisky, Scotch, Edward & John Burke, Limited 37,297

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"Gold Seal," for baking powder, Southern Coffee Co 8,771
"Gold Seal," for coffee, Southern Coffee Co. 8,773
"Humming Birds Cream Chewing Kiss," for confectionery, Thompson-Pettit Co 8,767
"Lanoble," for antiseptic suppositories, I. Neugroschi 8,774
"Lightning Yeast," for yeast, Lightning Yeast Co. 8,770
"Malt-Nut," for food preparations, American Pure Food Co 8,768
"Plantation Java Blend," for coffee, Southern Coffee Co 8,772

PRINTS.

"George Washington Back No. 606 Congress Playing Cards," for playing cards, United States Playing Card Co 418
"Standard Malt Extract," for malt extract, Henderson Lithographing Co 419
"The Favorite of the Farm," for harvest machinery, Milwaukee Harvester Co 420

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.

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ELEMENTARY EXPERIMENTAL CHEMISTRY: INORGANIC. By W. F. Watson, A.M. New York: A. S. Barnes & Co. 1901. 12mo. Pp. 320. Price $1.25.

The author, who is well known to readers of the SCIENTIFIC AMERICAN, has produced a most admirable textbook, one of the best, in fact, we have ever seen on the subject. The scheme of illustration can be highly commended. There are twenty full-page plates showing all the apparatus and chemicals used in experiments. This is an entirely new plan. The textbook is intended for students in high schools and junior classes in colleges, as well as for private learners. We think that the book will prove very valuable for the last-named persons. The text is clear, concise and admirably written.

HOW TO BUILD A THREE-HORSE POWER LAUNCH ENGINE. With a Full Set of Working Drawings and Explanatory Text. By E. W. Roberts, M.E. Cincinnati: Gas Engine Publishing Company. 1901. Quarto. Pp. 66. Price $2.50. Blue prints, $4 extra.

This book will be warmly welcomed by many amateurs who are desirous of building a launch gas engine. The working drawings are reproduced on a good scale, and blue prints may be obtained of the publishers. The type of engine selected seems to be an excellent one.

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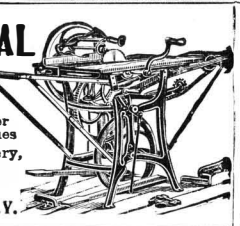

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Notes and Queries.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

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Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(8448) O. L. P asks: 1. How to construct a jump-spark coil. A. A spark coil for gas engines is described in the SCIENTIFIC AMERICAN, Vol. 72, No. 2, price ten cents. 2. Can a jump spark be timed so as to regulate the point of ignition in gas or gasoline engines? A. Yes. 3. How many cells of dry battery are required to properly operate coil? A. Six or more are ordinarily used.

(8449) J. J. S. asks: 1. In making Leyden jars, I have had great difficulty in coating the inside with tinfoil. Will you kindly advise me on the following points: Would it do equally well to half fill the jar with tinsel, of course coating the outside with tinfoil? A. No. The tinsel will not be continuous, nor will it be in contact with the sides of the jar. 2. Would it do to shellac the inside up to the proper height and shake in bronze powder? A. Not so well as tinfoil. 3. In using tinfoil, should the bottom, inside and outside be covered? A. Yes. There is not much difficulty in placing the tinfoil properly in the jar. Cut the foil into strips of two inches or thereabout in width. Apply the paste to the inside of the jar with a long-handled brush. Put the foil in with forceps or in any other convenient manner, and bring it to its place and rub it down with a dry brush with long bristles. 4. I have made a Wimshurst machine with 18-inch plates, but can only get a spark of ¾ inch. Is this all a machine of that size is capable of, or have I made some mistake in construction? A. The spark is not long when a Leyden jar is not used. And indeed when the jar is used, its effect is to render the discharge intense rather than to lengthen the spark.

(8450) F. S. writes: 1. A friend of mine got into an argument with me concerning electricity. I said it was made or generated by the use of a magnetic field or produced by the chemical changes which take place in a liquid cell. He said it was gathered or collected from the air in all cases, either by mechanical means or chemical means. He said he would not believe that I was right, and so I said I would see who was right; and please describe how it is made, so we may settle the question. A. Electricity is produced in batteries by chemical action; in most primary cells by dissolving zinc in sulphuric acid. It is produced in dynamos by revolving coils of wire in a magnetic field; in thermo-couples by heating the junction of two metals. The first two methods named are the ones by which most of the commercial current is generated. There is electricity always present in the atmosphere, which can be detected by the proper instruments, but which is seen by any one in thunderstorms. This electricity is, however, not used for any practical purpose. 2. I have a magneto-generator, such as are used in telephones, giving an alternating current because there are only two sets of coils on the armature. Why is it not possible to use a ring armature and have one continuous coil wound on it, having a one-piece commutator? Would it generate a continuous current by keeping the current up to a maximum instead of at zero and then a maximum, and about what would be the voltage? Could I increase the strength of the permanent magnetic field by wrapping it with magnet wire in the right direction, and if possible could you tell me the amperage of a telephone magneto-generator wound the way I have described? A. The current of the magneto is alternating because the armature is not provided with a commutator. A direct current can be produced by a single coil on an armature if there is a commutator. We do not know how much you can get out of your magneto; enough to ring a bell, surely, but not enough to do much more than this.

(8451) C. M. C. writes: May I trouble you with a request for information on the following phenomenon, to me curious, and as to which so far I have been unable to find any explanation? An ordinary incandescent electric-light bulb after the current is cut off exhibits for some hours a peculiar phosphorescent glow, emitted apparently from the inner surface of the glass and quite strong enough to enable a coarse print to be read if placed close to the bulb. This glow or phosphorescence becomes dimmer and stronger by pul-

(Continued on page 337)

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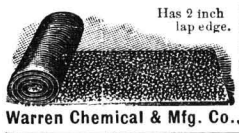

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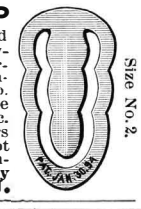

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(8452) W. C. writes: Referring to No. 8399, answer to B. R., page 253, current volume, under heading Notes and Queries, it is stated that the way to form a normal solution of sulphuric acid is to add 98 mg. to 1 c.c. H_2O; I have the honor to invite your attention to the following: A normal solution is formed by dissolving in 1,000 c.c. of H_2O (distilled) at 15.5 deg. C., the weight in grammes of the *hydrogen equivalent* of the active reagent.

SO_4 is the active reagent in H_2SO_4

SO_4 is bivalent, i. e., 96 grammes SO_4 = 2 grammes H.

∴ 48 grammes SO_4 = 1 gramme H.

98 grammes H_2SO_4 contain 96 grammes SO_4 (active reagent).

∴ 49 grammes H_2SO_4 contain 48 grammes SO_4 (or hydrogen equivalent).

∴ Dissolve 49 grammes H_2SO_4 in 1,000 c.c. H_2O.

A. The solution based on the hydrogen equivalent is in the United States called the "Equivalent Solution," and is in use very largely by pharmacists. It is usually taught in their schools. It is the chemical standard in England (see Sutton's Volumetric Analysis), but has not prevailed in this country. Cairns' "Quantitative Analysis." which is as much as any the American authority, page 305, gives the definition based upon the molecular weight of the substance, as we gave it in our note. Since receiving your letter we have referred the matter to a professor of analytical chemistry in one of our colleges, who is continually making such solutions, and to a prominent expert chemist in this city. Both of these are practical chemists and know even better than we what chemists employ as normal solutions. They agree that our former answer is the American practice. A normal solution is made up so that 1,000 cubic centimeters of the solution contains as many grammes of the reagent as its molecular weight. The molecular weight of sulphuric acid is 98. Therefore 98 grammes weight of sulphuric acid are to be added to distilled water, and the volume brought up to 1,000 cubic centimeters by the addition of distilled water. You inadvertently and doubtless unintentionally say "49 grammes in 1,000 cubic centimeters of water." This slip is frequently made. The total volume of the solution is 1,000 c.c.; 49 grammes of sulphuric acid measure between 27 c.c. and 28 c.c.

(8453) P. S. writes: 1. Can commercial calcium sulphide be used for phosphorescent paint or light? A. No. 2. If it cannot, what are its uses? A. It has some use in medicine. It may be used for the preparation of sulphureted hydrogen. 3. What is the chemical action of a secondary battery made of copper, zinc and lye? A. For a discussion of this subject, see Treadwell's "Storage Battery," price $1.75 by mail. In general, zinc is taken from the solution while charging and deposited upon the zinc plate; oxygen is evolved, which attacks the copper and forms copper oxide upon the positive plate. In the discharge the opposite changes take place. 4. If two pieces of annunciator wire about ten or more feet in length are laid parallel with the insulations touching and with the terminals at one end not connected and those at the other end connected through a telephone receiver and secondary of a medical coil in series, or one terminal to the platinum-pointed screw of a buzzer through the receiver and the other terminal at the same end connected to the vibrating contact, is the sound produced in the receiver caused by leakage, induction between the wires or do the wires act as a condenser? (This also takes place to an extent when the ground is used instead of either wire.) A. We scarcely understand your arrangement from the description; but, if there is a sound produced upon an open circuit, it is by means of waves transmitted across the space separating the wires, as is frequently the case by induction in the working of the telephone. 5. Are the use of the magneto, the galvanometer and similar instruments the only ways for testing for leaks? A. For methods of testing wires and cables, see the book on that subject by Webb, price $1; or Kempe's "Electrical Testing," price $7.25. Latest editions. 6. What is the average or extremes of resistance in woods? A. Dry wood is an insulator, and wet wood may have any resistance according to its wetness.

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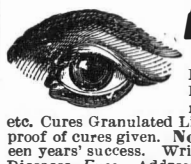

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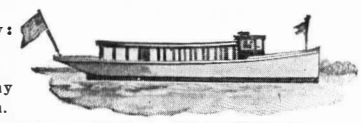

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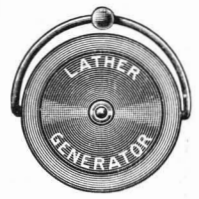

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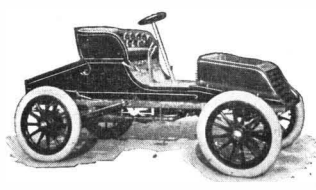

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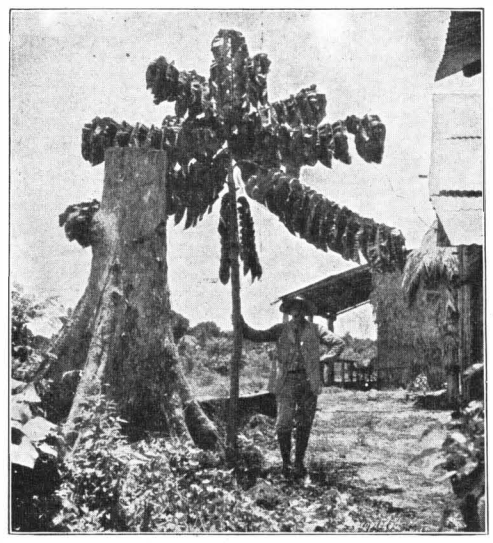

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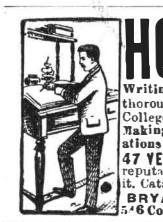

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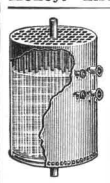

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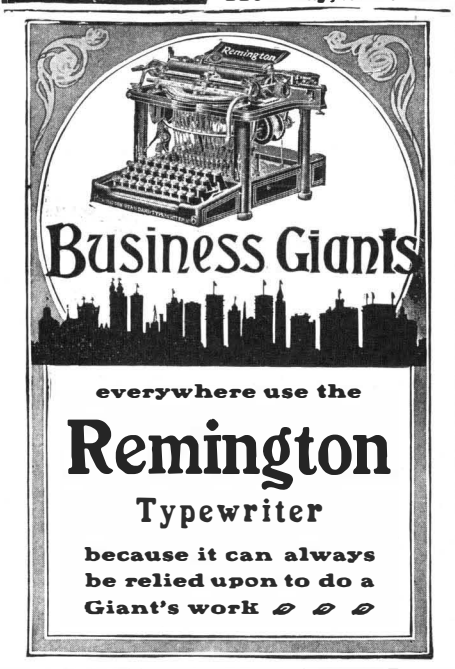

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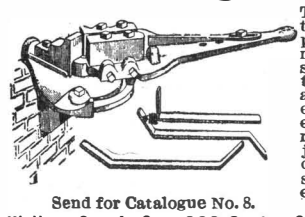

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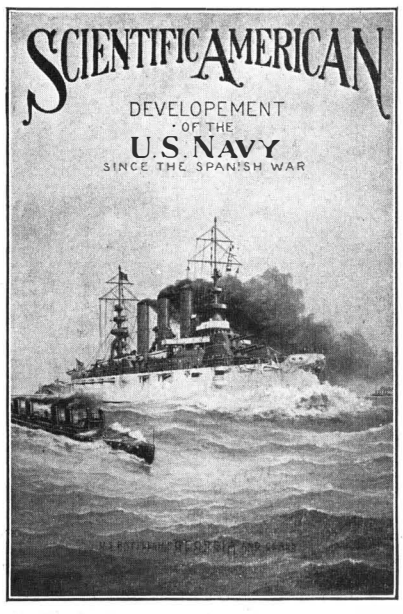

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